Supreme Court, U.S.
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70-38

APPENDIX

In the Supreme Court of the United States

OCTOBER TERM, 1970

No. [redacted]

FEDERAL POWER COMMISSION, PETITIONER

v.

FLORIDA POWER & LIGHT COMPANY, RESPONDENT

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FIFTH CIRCUIT

PETITION FOR CERTIORARI FILED NOVEMBER 10, 1970
CERTIORARI GRANTED FEBRUARY 22, 1971

In the Supreme Court of the United States

OCTOBER TERM, 1970

No. 958

FEDERAL POWER COMMISSION, PETITIONER

v.

FLORIDA POWER & LIGHT COMPANY, RESPONDENT

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FIFTH CIRCUIT

419-404—71——1

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In the Supreme Court of the United States

OCTOBER TERM, 1970

No. 958

FEDERAL POWER COMMISSION, PETITIONER

v.

FLORIDA POWER & LIGHT COMPANY, RESPONDENT

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FIFTH CIRCUIT

RELEVANT DOCKET ENTRIES—FEDERAL POWER COMMISSION

1965	
February 26	Commission Order Initiating Investigation and Hearing.
March 19	Florida Public Utilities Commission's Notice of Intervention.
April 5	Designation of Presiding Examiner.
June 23	Service of Commission Staff Testimony and Exhibits.
July 2	Florida Power & Light's Motion to Strike Prepared Direct Testimony and Exhibits.
July 9	Commission Staff Reply to Motion to Strike Prepared Direct Testimony and Exhibits.
July 21	Presiding Examiner's Ruling on Florida Power & Light's Motion to Strike.
August 24	Service of Florida Power & Light's Testimony and Exhibits.
August 31	Commission Staff Motion to Strike Prepared Direct Testimony and Exhibits.
September 7	Florida Power & Light's Answer to Motion to Strike Prepared Direct Tesimony and Exhibits.
September 7	City of Clewiston, Florida Petition to Intervene.
September 13	Florida Power & Light's Motion to Strike Rebuttal Testimony and Exhibits.

September 10	Commission Staff Reply to Motion to Strike Prepared Rebuttal Testimony and Exhibits.
September 17	Florida Power & Light's Answer to Petition to Intervene of City of Clewiston, Florida.
September 29	Commission Order Authorizing Intervention of the City of Clewiston, Florida on a Limited Basis and Out of Time.
October 4–5 October 7–8 October 12 November 3	Hearings Before Presiding Examiner.

1966

July 12	Presiding Examiner's Initial Decision and Certification of the Record Accompanying the Initial Decision.
August 5	Commission Notice of Extension of Time for Filing Exceptions.
August 25	Florida Power & Light's Brief on Exceptions.
August 25	Florida Public Service Commission Adoption of Brief on Exceptions of Florida Power & Light.
September 14	Commission Staff Brief Opposing Exceptions.
September 14	Florida Power & Light's Motion for Oral Argument.
October 24	Commission Notice Fixing Oral Argument.
November 28	Oral Argument.

1967

March 20	Commission Opinion No. 517, Opinion and Order Determining Jurisdiction.
April 4	Florida Power & Light's Motion for Stay.
April 11	Florida Power & Light's Application for Rehearing.
May 2	Commission Order Denying Application for Rehearing.
May 2	Commission Order Providing for Extension of Time.

COURT OF APPEALS

June 29	Florida Power & Light's Petition for Review.
October 6	Florida Public Service Commission's Motion for Leave to Intervene.
October 13	Commission Response to Motion of Florida Public Service Commission.
October 26	Court Order Granting Intervention of Florida Public Service Commission.

November 24	City of Gainesville and Gainesville Utilities Department Petition to File Brief Amicus and Brief Amicus.
November 28	Commission Acquiescence in Petition of City of Gainesville and Gainesville Utilities Department.
December 11	Florida Power & Light's Opposition to Petition of City of Gainesville and Gainesville Utilities Department.
December 21	Court Order Granting City of Gainesville and Gainesville Utilities Department to File Brief Amicus Curiae and Denying Leave to Present Oral Argument.
1968	
May 7	Oral Argument before Fifth Circuit.
1970	
July 13	Opinion and Judgment of Fifth Circuit.

IN THE

United States Court of Appeals

FOR THE FIFTH CIRCUIT

Docket No. 24,956

FLORIDA POWER & LIGHT COMPANY, *Petitioner,*

v.

FEDERAL POWER COMMISSION, *Respondent*

On Petition To Review and Set Aside Opinion and Orders of the Federal Power Commission

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JOINT RECORD

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Testimony of Cleve R. Jacobsen

Q. Would you state your name and address? A. My name is Cleve R. Jacobsen. I reside at 4800 Springbrook Drive, Annandale, Virginia.

Q. By whom are you employed and in what capacity? A. I am employed by the Federal Power Commission (FPC) as an Electrical Engineer in the Bureau of Power.

Q. What position do you occupy in the Bureau of Power? A. I am a Staff Electrical Engineer in the Interconnection and Coordination Section of the Division of Electric Resources and Requirements.

Q. What are your duties in your present position? A. My duties are to review and evaluate technical reports and conduct studies and research to determine the economic and technical advantages of interconnection and coordination of electric system operations for the purpose of encouraging voluntary interconnections among various electric systems to realize maximum economy, increased efficiency, and proper utilization and conservation of natural resources.

I assisted the FPC Staff counsel in the preparation of the stipulation of facts which was received in evidence in the matter of the *Arkansas Power & Light Company,* FPC Docket No. E-7090, and I was available to testify for the Staff in that proceeding if the need arose.

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I prepared written testimony in the matter of *Alabama Electric Cooperative, Inc.* v. *Alabama Power Company,* FPC Docket No. E-7183, and am scheduled to appear as a witness before a FPC Hearing Examiner in this proceeding during the summer.

I also act as a consultant and I give expert advice on electric transmission and coordination matters to the FPC

and its Staff and to other Governmental bodies and defense agencies.

In addition, I prepare and am responsible for power flow studies for existing and proposed electric networks for use in performance evaluation of such networks.

As a principal FPC Staff expert on electric transmission and coordination matters and electric system operations, I am available to testify at FPC hearings and to render technical assistance to Staff Attorneys in connection with such hearings.

Q. In connection with your duties at the FPC have you ever visited and examined the facilities of any electric utilities? A. Yes.

Q. Which electric facilities have you visited and examined? A. The electric facilities which I have visited and examined include the following:

Virginia Electric Power Company—A 500 kv substation and transmission line in the vicinity of Harrisonburg, Virginia and the automatic dispatch center in Richmond, Virginia.

Pennsylvania-New Jersey-Maryland Interconnection — The automatic dispatch center located on premises of Philadelphia Electric Company in Philadelphia, Pennsylvania.

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Philadelphia Electric Company—The automatic dispatch center in Philadelphia, Pennsylvania.

General Public Utilities Corporation—The automatic dispatch center in Reading, Pennsylvania.

Metropolitan Edison Company—The dispatch center in Reading, Pennsylvania.

Middle South Utilities, Inc.—The automatic dispatch center in Pine Bluff, Arkansas.

Louisiana Power & Light Company—The Sterlington generating plant and associated substation and transmission lines.

Arkansas Power & Light Company—The Couch generating plant and the Cecil Lynch generating plant and their associated substations and transmission lines. The Woodward substation and associated transmission lines.

Florida Power & Light Company—The Port Everglades generating plant and the Lauderdale generating plant and their associated substations and transmission lines. The automatic dispatch center in Miami.

Potomac Electric Power Company—The Chalk Point generating plant and associated substation and transmission lines.

The Southern Company System—The automatic dispatch center in Birmingham, Alabama.

Alabama Power Company—The Gorgas No. 2 and Gorgas No. 3 steam generating plants. The Lewis Smith hydro plant. The transmission lines in the vicinity of Evergreen and Clio substations. The Phenix City 110 kv substation and its associated 110 kv transmission tie line to Georgia Power Company. The system dispatch center at Magella substation.

Q. Did you participate in the National Power Survey conducted by the Federal Power Commission during the years 1962, 1963, and 1964?

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A. Yes.

Q. What was the nature of your participation in the National Power Survey? A. I contributed to the National

Power Survey by performing technical engineering work in accumulating and analyzing, as well as preparing, studies and reports embracing both electric transmission and coordination and electric distribution. This work included system planning for new high voltage, large capacity transmission lines and determination of the costs related to these facilities. The work also included studies of the economic and technical advantages of interconnecting electric facilities and alternative plans for such interconnections. I helped to maintain liaison with the various technical advisory committees composed of representatives of the public and private segments of the electric power industry who assisted the Commission in making the survey. Certain technical segments of the Commission's report on the survey were drafted by me. The National Power Survey Report was issued by the FPC in December 1964.

Q. How long have you been employed in your present position? A. Since November 5, 1962.

Q. Please give a brief outline of your engineering training and experience prior to entering your present position. A. I was employed for about two years (1939-1940) as an assistant design engineer and substation operator with the Memphis Light, Gas and Water Division, an agency of the City of Memphis, Tennessee. As assistant design engineer, my duties consisted of the preparation of contract plans for the construction of electrical underground distribution system in the City of Memphis.

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I was an officer in the Corps of Engineers, U.S. Army, for six years (1940-1946). Some of my principal engineering assignments included assisting in the Alcan Highway construction project; serving as Post Engineer of the Port and Post of Skagway, Alaska, where I was responsible for the supervision, operation and maintenance of a combined

Army and Skagway municipal electric utility system; and assisting in miscellaneous construction projects in the European and Pacific Theatres of Operations.

I was employed for about 16 years (1946-1962) with Commonwealth Associates, Inc. (formerly Commonwealth & Southern Corp. a New York Corporation) in Jackson, Michigan. Commonwealth Associates, Inc. is a long established organization of consulting and design engineers, whose major background is in the field of generation, transmission and distribution of electric power for electric utilities. The clients of Commonwealth Associates, Inc. included many electric utilities operating in the mid western section of the United States.

My sixteen years of diversified consulting and design experience with Commonwealth Associates, Inc. included thirteen years as a registered engineer in progressive engineering work, and over ten years involved responsible charge of advance work as job engineer with supervision of the work of other professional engineers. I planned, directed, and supervised the work of a section requiring a general background of electric utility operations, including bulk power supply, distribution systems, and overhead line design. The work included both the design of electric facilities and studies of electric systems.

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Q. Have you ever attended any engineering school? A. Yes. I atended the University of Tennessee at Knoxville from 1932 to 1936.

Q. Did you receive a degree from the University of Tennessee? A. Yes. I received the Degree of Bachelor of Science in Electrical Engineering.

Q. Do you belong to any engineering societies? A. I do.

Q. Would you state what engineering societies you belong to and what grade of membership you hold? A. I am a

Senior Member of the Institute of Electrical and Electronic Engineers, formerly known as the American Institute of Electrical Engineers; a member of the Washington Society of Engineers; a member of the District of Columbia Society of Professional Engineers; a member of the National Society of Professional Engineers; and past member of the Edison Electric Institute — American Gas Association Transportation Committee.

Q. Have you ever participated on any Institute of Electrical and Electronic Engineers (IEEE) Committees? A. Yes. From 1953 to 1962 I served on the following Committees in the Michigan Section of IEEE (formerly AIEE): Chairman, Public Relations Committee, Chairman, Program Committee, Chairman, Student Guidance Committee, and a member of the Section Meetings Group. From 1959 to 1964, I served on the National IEEE Substations Committee, Transmission Substation Subcommittee, Working Group on Project 59.1—"Recommended Minimum Clearance in Substations", and I was Chairman of Working Group on Project 53.1—"Extra-High Voltage Substations."

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Q. Are you a registered professional engineer? A. I am.

Q. Where are you registered? A. I am registered in the States of Michigan (by examination); Ohio, and Pennsylvania.

Q. Have you visited the offices and properties of Florida Power & Light Company (FPL) in preparation for your participation in this proceeding?. A. I have.

Q. When did you make your visit? A. In March 1965.

Q. Before your visit to Florida Power & Light Company, did you make any preparations for this field trip? A. Yes. I made an office study of the generating and transmission parts of the electric system of the Florida Power & Light Company and its affiliates of the Florida Operating Committee.

Q. What do you mean by the term "electric system?" A. By the term "electric system" I mean the physically connected generation, transmission, distribution, and other facilities operated as an integral unit under one control, management, or operating supervision.

Q. What are the affiliates of Florida Power & Light Company to which you refer? A. Florida Power & Light Company (FPL) is one of five electric systems that comprise The Florida Operating Committee (Florida Pool). The

other operating companies in the Florida Pool include Florida Power Corporation (F.P. Corp.) and Tampa Electric Company (TEC). Orlando Utilities Commission (Orlando) and the City of Jacksonville (Jacksonville) have been invited to attend meetings for the last year or so and are considered as assoicate members of the Committee.

Q. Would you state what information you used in your office study? A. The information that I used in that study is that reported by FPL and its affiliated companies in the Florida Pool, to the Federal Power Commission on forms prescribed by the Commission.

Q. Would you please identify the reports filed with FPC which have information on FPL that you used in your office study? A. The reports which I used include the following: FPC Form No. 1, Annual Report, filed by FPL for the year 1963; FPC Form No. 12, Power System Statement, filed by FPL for the year 1963; FPC Form No. 1, Annual Report, filed by F.P. Corp. for the year 1963; FPC Form No. 12, Power System Statement, filed by F.P. Corp. for the year 1963; FPC Form No. 1, Annual Report, filed by TEC for the year 1963; FPC Form No. 12, Power System Statement, filed by TEC for the year 1963; FPC Form No. 12, Power System Statement, filed by Orlando for the year 1963; and

FPC Form No. 12, Power System Statement, filed by Jacksonville for the year 1963.

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Q. Referring to Staff Exhibit No. 1 for identification, what territory does FPL supply electric service? A. FPL supplies electric service in most of the territory along the greater part of the east coast of Florida (except the Jacksonville area and five other municipalities which have municipal systems), including the Cape Kennedy area, the agricultural area around southern and eastern Lake Okeechobee, the lower west coast area, and portions of central and north central Florida.

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It supplies electric service to about 931,400 customers located in over 500 cities, rural communities and adjacent areas, including the cities of Miami, Miami Beach, Coral Gables, Hialeah, Hollywood, Fort Lauderdale, Palm Beach, West Palm Beach, Daytona Beach, Ormond Beach, Melbourne, Cocoa, Titusville and St. Augustine on the east coast; Fort Myers, Punta Gorda, Sarasota and Bradenton in the western part; and Okeechobee, Pahokee, Belle Glade, Palatka, Lake City and Live Oak in central and northern parts of the State.

Generally the peak demand occurs in the period December to March.

Q. Will you briefly describe FPL and its operations? A. FPL is a corporation engaged in the generation, transmission, distribution, and sale, at wholesale and retail, of electric energy. FPL also interchanges electric energy with certain other Florida utilities. It is organized under the laws of the State of Florida and maintains its principal business

(51)

office at 4200 W. Flagler Street, Miami, Florida. The System's Load Dispatching Office and General Engineering Office is located in the Ryan Building, 400 S. W. 2nd Avenue, Miami, Florida.

FPL owns and operates an electric generating and transmission system in the State of Florida, which is interconnected with electric generating and transmission systems owned and operated by F.P. Corp., TEC, Jacksonville and Orlando.

52

FPL has four dispatching divisions. The name and location of division headquarters are as follows:

(a) The Western Division—Punta Gorda
(b) The Eastern Division—Palm Beach
(c) The Southern Division—Miami
(d) The Northern Division—Sanford

FPL delivered firm electric energy during the year ended December 31, 1964, to 6 rural cooperatives, namely: Florida Keys Electric Cooperative, Glades Electric Cooperative, Lee County Cooperative, Clay Electric Cooperative, Peace River Electric Membership Cooperative and Okefenokee Electric Membership Cooperative. FPL also delivered emergency power for 3 and ½ months to the municipal system of the City of New Smyrna Beach and for one day to the municipal system of the City of Homestead.

As of December 31, 1964, FPL owned and operated 10 steam-electric generating plants having 22 units with a total combined manufacturer's maximum generator nameplate rating of 2,823,390 kw. FPL had under lease one internal combustion electric generating plant with a manufacturer's maximum generator nameplate rating of 700 kw. It owned 10 mobile internal combustion electric generating units with a combined manufacturer's maximum generator nameplate

rating of 2,560 kw. The combined 1964 FPL manufacturer's maximum generator nameplate rating was 2,826,650 kw, which is based on

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capabilities under cold weather conditions and applies only to favorable conditions during the months of December, January, February and March. During the remaining months varying limitations are imposed upon FPL generating equipment due to higher circulating water temperatures.

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Q. Mr. Jacobsen. Is there anything further concerning FPL or its operations that you would like to discuss? A. Yes. On December 31, 1964, FPL had about 2,606 miles of transmission lines (pole line miles) at 69 kv or above, of which about 447 miles were operating at 240 kv, about 565 miles were operating at 138 kv, about 393 miles were operating at 115 kv, and about 1,202 miles were operating at 69 kv.

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Q. Mr. Jacobsen. Does FPL have an economy dispatch computer in its System Dispatching Office? A. Yes.

Q. Please briefly describe the computer's operation. A. FPL has an Economy Dispatch Computer in its System Dispatching Office that started operation in 1959.

This computer assigns each load change on the System as shown on the daily load curve, Staff Exhibit No. 8, to a combination of generating units such that the FPL System will operate most economically. FPL's computer control system provides control of 10 steam-electric generating plants with 21 units and the net flow of 6 tie-lines including 2 tie-lines connected to Jacksonville, one tie-line connected to

(61)

Orlando, 2 tie-lines connected to F.P. Corp. and one tie-line connected to TEC.

The computer assigns each generating unit a definite megawatt output when it senses a load change. If for any reason the generating unit cannot accommodate its assignment, then generation changes are reallocated. The computer considers cost of fuel at the various plants, generating unit efficiencies and transmission line losses when assigning unit output.

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The System Dispatchers can switch units in or out of the computer as desired. The computer works with the units that are switched into it. The Dispatchers' concerns are to keep generation and load in balance. Units are brought on the line as additional regulating range is required. The computer automatically allocates the generation changes among the units on a lowest over-all cost basis.

FPL's load is in a constant state of change; therefore, the computer must be provided information of these changes constantly as they occur. Such information is referred to as computer input. Important input are the actual telemetered generation of FPL units and tie-line power flow data with neighboring systems. This telemetered data can be observed on recorders mounted on the load control telemeter panels in the System Dispatching Office. Other inputs that the dispatcher feeds into the computer by digital setters are the high and low limits of the generating units, and the type and cost of fuel being used. The computer also takes into consideration the input data for the generating unit efficiencies and System transmission line losses.

* * * * * * * * * * * * *

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Q. Mr. Jacobsen. Does FPL belong to a voluntary organization named Interconnected Systems Group (ISG)?

A. Yes. FPL belongs to a voluntary organization named Interconnected Systems Group (ISG) which is composed of electric utilities operating in that section of the United States which is bounded generally on the north by Canada and Lake Superior, on the south by the Gulf of Mexico and the Atlantic Ocean, and on the west by the eastern portions of the States of Montana and Wyoming and the western boundaries of the States of Nebraska, Kansas, and Oklahoma, and on the east by Lake Michigan and the western boundaries of the States of Pennsylvania and Maryland. There are four regional units or division in ISG, one unit for the Northwest Region, the Southwest Region, the Southeast Region, and the Northeast Region, respectively.

FPL and the other operating companies of the Florida Pool belong to the Southeast Region of ISG. ISG is one of the major interconnections in North America. Its regions are represented on the North American Power Systems Interconnection Committee (NAPSIC), which is also a voluntary organization. NAPSIC was formed in 1963 of electric utility operating personnel representing major electric utility operating areas or power pools in North America.

* * * * * * * * * * * * *

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Q. Have you anything further to say concerning ISG?

72

A. Yes. CANUSE, PJM and ISG representing about 140 electric utilities, of which FPL is one, operate continuously in parallel. Most of these systems operate on a form of automatic control called Tie-Line Bias which allows each system to assist in maintaining the standard 60-cycle frequency.

* * * * * * * * * * * * *

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Q. Is there anything which you wish to add pertaining to the system operation and service territory of FPL's other operating affiliates in the Florida Pool? A. Yes. F. P. Corp. is engaged, within the State of Florida, in the generation, transmission, distribution and sale of electricity. It renders electric service to about 325,000 electric customers in its territory of about 20,600 square miles with a population of about 1,800,000. Its generating stations have a manufacturer's maximum generator nameplate rating of 1,169,113 kw and are interconnected by a network of 240 kv, 120 kv and 69 kv transmission lines. The F. P. Corp. transmission system is interconnected with transmission lines of Georgia Power Company, Gulf Power Company, and three of the Florida Pool electric utilities; FPL, TEC, and Orlando. These

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points of interconnections are delineated on Staff Exhibit No. 88. There are transfers of interstate energy across the Florida-Georgia State boundary pursuant to Southern Services, Inc., Rate Schedule, FPC No. 27, Item J by reference. The kwh interstate energy transfers for the year ending December 31, 1964, on the tie-lines shown on Staff Exhibit No. 88 into the State of Florida (F.P. Corp.) from the State of Georgia (Georgia Power Co.) totaled 99,720,000 kwh and the kwh energy transfer out of the State of Florida into the State of Georgia totaled 82,182,000.

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Q. Mr. Jacobsen. Have you made a study and analysis of the magnitude and direction of power flow over any of the transmission line interconnections between Georgia Power

Company and F. P. Corp. shown on Staff Exhibit No. 15? A. Yes. I have.

Q. For what period of time did you make your study and analysis? A. Primarily for the year ending December 31, 1964, and a few specific days in 1965.

Q. Mr. Jacobsen. In your opinion, during the period of your study did interstate electric power flow over the interconnections from Georgia Power Company, located in the State of Georgia, to the F. P. Corp. System, located in the State of Florida? A. Yes.

Q. What information did you study to reach this conclusion? A. FPC Form No. 12, Power System Statement, filed by F. P. Corp. for the year 1964 and F. P. Corp. Daily Operating Reports, Staff Exhibits No. C1 and C2, and also the way the Florida Pool, F. P. Corp. and FPL operate.

Q. Mr. Jacobsen. Does Southern Services, Inc. act as an agent for Georgia Power Company, Alabama Power Company, Mississippi Power Company and Gulf Power Company in the execution of Southern Services, Inc., Rate Schedule, FPC No. 27? A. Yes.

* * * * * * * * * * * *

85

Q. Mr. Jacobsen. Have you made a study of load conditions and power flow in Florida Pool Systems to determine if commingled power flows into the FPL System over any of the aforementioned interconnections? A. Yes. I made a detailed study and analysis of power flow on 22 days in 1964 over the 115 kv F. P. Corp. Turner Plant-FPL Sanford Plant tie-line, and power flow from Georgia Power Company to the FPC Turner Plant over F. P. Corp. transmission lines. I also examined the power flow over the other tie-lines but not in as much detail.

Q. Mr. Jacobsen. Have you prepared or have you supervised the preparation of an exhibit, as a result of your study

and analysis, that shows the route of flow of interstate power from Georgia Power Company, over F.P. Corp. transmission lines into the FPL System over the F.P. Corp. Turner Plant-FPL Sanford Plant 115 kv transmission tie-line? A. Yes.

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Q. Mr. Jacobsen. I show you an exhibit consisting of 7 pages numbered consecutively from 1 thru 7. Page 1 is a diagram entitled "Route of Interstate Electric Power Flow in 1964 from Georgia Power Company to Florida Power & Light Company's System Over the Florida Power Corporation Transmission Lines", and 6 pages numbered 2 to 7 of tabulated data entitled "Hourly Interstate Power Flow on Selected Days in 1964 From Georgia Power Company to Florida Power & Light Company Over Florida Power Corporation Transmission Lines Shown on Load Flow Diagram on Page 1*." I ask you if this is the exhibit to which you refer? A. It is.

Staff Counsel: Mr. Examiner. The staff requests that the exhibit as identified by Mr. Jacobsen be marked for identification as Staff Exhibit No. 18.

Q. Mr. Jacobsen. Please describe the diagram, page 1, of this exhibit. A. This is a simplified diagram that, among other things, shows transmission lines, substation busses, and direction of interstate power flow. The purpose of the diagram is to show the transmission lines and substation busses over which interstate power flows from Georgia Power Company, over F.P. Corp. transmission lines, and into the FPL System. The arrows adjacent to the transmission lines indicate the direction of power flow for each day and hour analyzed. The color of the arrow, as designated in the legend, indicates whether the power flow is interstate, commingled or unidentified.

Q. Mr. Jacobsen. Please describe the 6 pages of tabulated data, page number 2 to 7, in Staff Exhibit No. 18.

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A. These pages of tabulated data indicate, among other things, the 22 days and hours of these days, that power flow was studied to show that commingled power flowed into the FPL System. It also shows the direction and magnitude of power flow over specific transmission lines in sections of the F.P. Corp. and FPL Systems.

Q. Mr. Jacobsen. In your study and analysis did you consider the substation busses as a point. A. I considered them as a point.

Q. Mr. Jacobsen. What information did you use in preparing Staff Exhibit No. 18? A. The information that I used was obtained from System maps in FPC Forms No. 12, Power System Statements, filed by FPL and F.P. Corp., and F.P. Corp. Daily Operating Reports, Staff Exhibit No. C 2.

Q. Mr. Jacobsen. Do the arrows shown adjacent to the transmission lines on Staff Exhibit No. 18 indicate the flow of power for every day and hour that was studied and analyzed as indicated in Staff Exhibit No. 18? A. Yes.

Q. Mr. Jacobsen. Referring to Staff Exhibits No. 18 and No. C 2 will you describe your analysis of interstate power flow? A. Yes. For the purpose of this analysis only the two 115 kv transmission line interconnections between Georgia Power Company and F.P. Corp.'s Jasper Substation were considered. These tie-lines are the Kettle Creek-Jasper and Pine Grove-Jasper 115 kv transmission lines. On days as shown on Staff Exhibit No. 18, the Jasper Substation

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Daily Operating Reports, Staff Exhibit No. C 2, interstate power flowed over these two interconnections into F.P. Corp.'s Jasper Substation, reference Points (1) and (2). The Jasper Substation Daily Operating Reports also show that unidentified power flowed from Suwannee Plant over

the 115 kv Suwannee-Jasper transmission line into the Jasper Substation bus, reference Point (3). The Jasper Daily Operating Reports for the same days and hours indicate commingled power flowed toward White Springs Substation over both the Fort White-East and Fort White-West 115 kv transmission lines, reference Points (4) and (5). The Fort White Substation Daily Operating Reports, for the same days and hours show that commingled power was flowing into the Fort White Substation bus, reference Points (6) and (7). The Fort White Substation Daily Operating Reports show for these same hours that commingled power flowed from Fort White Substation to the Turner Plant Station bus over the Silver Springs 115 kv transmission line, reference Point (8). The Turner Plant Daily Operation Reports for the same days and hours show commingled power flowing into the Turner Station bus over the Silver Springs transmission line, reference Point (9). The Turner Plant Daily Operation Reports show for the same days and hours commingled power flowed from the Turner Station bus to the FPC Sanford Plant bus over the Turner-Sanford 115 kv transmission line, reference Point (10).

Q. Mr. Jacobsen. Where is the transfer point of F.P. Corp.'s delivery of commingled power to the FPL System over the Turner-Sanford 115 kv transmission tie-line?

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A. The transfer point according to FPC Form No. 12, 1964, Power System Statement, Schedule 8, page 19, filed by FPL is at a point near Lake Monroe, Florida.

Q. Mr. Jacobsen. Why did you refer in your above testimony to the power flow from Suwannee Plant to Jasper Substation as unidentified power flow? A. I did not attempt to show whether the flow of power from Suwannee Plant to Jasper Substation was intrastate power or commingled power so I identified or designated it arbitrarily as unidentified power flow. Whether this power could be

proven to be either interstate or commingled power would not change my opinion as to whether commingled power flowed over the Turner-Sanford transmission tie-line.

Q. Mr. Jacobsen. Do you have anything further to say about your study and analysis of interstate power flow from Georgia Power Company, over the Jasper-Live Oak 69 kv tie-line or the Turner-Sanford 115 kv tie-line, through the F.P. Corp. System transmission lines into the FPL System? A. Yes. I would like to amplify the results of my study and analysis made of interstate power flow from Georgia Power Company over F.P. Corp. transmission lines into the FPL System over the Turner-Sanford 115 kv tie-line as shown in Staff Exhibits No. 18 and No. C 2.

Jasper Substation Daily Operating Reports, Staff Exhibit No. C 2 indicate power flow readings every hour in the day for the Pine Grove-Jasper and Kettle Creek-Jasper 115 kv interconnections,

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reference Points (1) and (2) on Staff Exhibit No. 18. However, for the power flow over the Fort White-East and Fort White-West 115 kv transmission lines, reference Points (4) and (5) on Staff Exhibit No. 18, readings are recorded only for the hours from 7 a.m. to 9 p.m., inclusive.

Fort White Substation Daily Operating Reports, part of Staff Exhibit No. C 2, indicates power flow readings over circuits connected to the Fort White substation bus were recorded only from 7 a.m. to 9 p.m., inclusive, reference Points (6), (7) and (8) on Staff Exhibit No. 18.

The Turner Plant Daily Operation Reports, part of Staff Exhibit No. C 2 indicates that power readings on circuits connected to the Turner Plant Station bus, reference Points (9) and (10) on Staff Exhibit No. 18, are recorded every hour in the day.

After studying the Daily Operating Reports, Staff Exhibit No. C 2; the way the F.P. Corp. System operates, and

the pattern of power flow over transmission lines during the early morning hours of the F.P. Corp. System, it is my opinion that interstate and commingled power flowed from Georgia Power Company over the F.P. Corp. System transmission lines through reference Points (1), (2), (4), (5), (6), (7), (8), (9) and (10) into the FPL System over the Turner-Sanford 115 kv tie-line, during earlier hours than 7 a.m. on 20 of the 22 days listed in Staff Exhibit No. 18.

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Q. Mr. Jacobsen. Have you prepared or have you supervised the preparation of an exhibit showing the additional hours of commingled power flow? A. Yes.

Q. Mr. Jacobsen. I show you an exhibit entitled "Hourly Interstate Power Flow On Selected Days In 1964 From Georgia Power Company to Florida Power Corporation Transmission Lines Shown On Load Diagram On Page 1 of Staff Exhibit No. 18 consisting of 5 pages of tabulated power flow data, and ask you if this is the exhibit to which you refer? A. It is.

Staff Counsel: Mr. Examiner. The Staff requests that the exhibit as identified by Mr. Jacobsen be marked for identification as Staff Exhibit No. 19.

Q. Mr. Jacobsen. Please describe Staff Exhibit No. 19. A. This exhibit primarily shows evidence of interstate power flow from Georgia Power Company to the FPL System routed over F.P. Corp. transmission lines, as shown on the one-line diagram of Staff Exhibit No. 18. The power flow tabulated is for hours earlier than 7 a.m. on days for which the power flows are not completely recorded on the Jasper and Fort White Substations-Daily Operating Reports part of Staff Exhibit No. C 2.

Q. Mr. Jacobsen. What are the similarities and basic differences between the tabulated data shown in Staff Exhibit No. 18 and Staff Exhibit No. 19?

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A. Both Staff Exhibit No. 18 and Staff Exhibit No. 19 refer to the one-line diagram shown in Staff Exhibit No. 18 to show the route of power flow over transmission lines and through designated reference Points at all hours listed in these two tabulations. However, the significant difference is that Staff Exhibit No. 18 shows power flow at 7 a.m. or after on 22 days, whereas Staff Exhibit No. 19 shows power flow before 7 a.m. on 20 of the 22 days.

Q. Mr. Jacobsen. Do you have any further comments on Staff Exhibit No. 19? A. Yes. The 5 pages of tabulated data indicate the hours on the 20 days that power flow was studied. It also shows the direction and magnitude of power flow over specific transmission lines in portions of the F.P. Corp. and FPL Systems as delineated on the one-line diagram of Staff Exhibit No. 18.

Q. Mr. Jacobsen. Do the arrows shown adjacent to the transmission lines on the one-line diagram, Staff Exhibit No. 18, indicate the direction of interstate and commingled power flow for each day and hour analyzed that flows into the FPL System? A. Yes. The color of the arrow, as designated in the legend, indicates whether the power flow is interstate, commingled or unidentified.

Q. Mr. Jacobsen. Did you consider the substation busses as a point in your study of power flow shown in Staff Exhibit No. 19. A. I considered the substation busses involved as a point.

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Q. Mr. Jacobsen. Please describe how electric systems react to a change in frequency. A. Staff Exhibit No. 8A for identification is a reproduction of a FPL System frequency recorder chart for February 17, 1965, between the hours of 11 a.m. and 1 p.m. The loss of about 580 mw of

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generation by a midwestern electric utility system in the Interconnected Systems Group (ISG) at about 11:40 a.m., February 17, 1965, is shown on the frequency recorder chart. Member systems in the ISG, including FPL, responded automatically to make up the generation deficiency. As shown on the frequency recorder chart, frequency returned to normal, i.e., 60 cycles, on all systems in a period of minutes. Reversal of this action will occur should FPL lose a generator unit of certain nameplate rating. Due to the F.P. Corp. System limitations of power transfer at the Fort White Substation, sudden outage of FPL generators of capacity greater than about 130 mw may result in the Florida peninsula being separated from the ISG. This condition is discussed in minutes of the Florida Operating Operating Committee, Staff Exhibit No. 3.

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In the event there is a sudden outage of generation on Systems in the Florida Pool, the ISG would come to the assistance of FPL and other members of the Pool. There is a reference in Staff Exhibit No. 3 which describes the procedure of Florida Pool members to follow to prevent over-generation after losses of units, plants, customer loads, or major loads.

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Q. Does any member of the Florida Pool exchange seasonal capacity with any of its neighbors? A. Yes. F.P. Corp. exchanges seasonal capacity with the Southern Pool. The Southern Pool receives 100,000 kilowatts from F.P. Corp. during the Southern System's summer peak load period and delivers

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a like amount to F.P. Corp. during the latter's winter peak load period. However, a study of Staff Exhibit No. C 1 and No. C 2 shows that for many days of the year including the peak load periods there is flow of power in both directions during a 24 hour day over the F.P. Corp.-Southern System interconnection.

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Q. Mr. Jacobsen. Do you have anything to add to your description of the operations of the Florida Pool? A. Yes. The five-system Florida Operating Committee provides joint planning and operation of the Florida Pool. The pooling arrangement of spinning reserves and emergency capacity increases the reliability of the Florida Pool.

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The member companies of the Florida Pool gain system security by Committee planning of maintenance work on major generating equipment. Coordinated scheduling of plant overhauls avoids having the biggest units out of service at the same time.

The five systems of the Florida Pool in September, 1963, began exchanging information daily on the amount of spinning reserve each expected to carry during the System peak.

Each operating company in the Florida Pool need not rely solely on its own generating sources to meet emergencies. Each operating company may call upon member companies of the Florida Pool and its total resources for whatever the individual operating company capacity and energy requirements may be. By the same token, each operating company, as a pool member, assists other members in meeting their requirements. This mutual assistance is made possible by among other things, advance coordinated planning of the installation of generating facilities, maintenance of

facilities, and the availability of emergency capacity between Pool members and between F.P. Corp. and the Southern System.

Q. Mr. Jacobsen. Does FPL have, through interchange or emergency agreement, spinning reserves instantly available to it? A. Yes. FPL reports in FPC Form No. 12, Power System Statement, for the year 1964, that it has instantly available for emergencies: 80,000 kw from F.P. Corp., 63,000 kw from TEC, 46,000 kw from Jacksonville and 43,000 kw from Orlando.

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Q. Mr. Jacobsen. Do F.P. Corp. and the Southern System have a mutual emergency standby agreement? A. Yes. Such an agreement is described in Article VIII of Southern Services, Inc., Rate Schedule FPC No. 27, Item J by reference.

Q. Mr. Jacobsen. Do F.P. Corp. and TEC have automatic dispatch system? A. Yes. Both have computers to automatically dispatch their major generating units.

Q. Mr. Jacobsen. What is the tie-line bias for F.P. Corp. and TEC? A. The tie-line bias for TEC is 15 mw and 22mw for F.P. Corp.

Q. Mr. Jacobsen. What observations did you make in studying the overhaul schedules, Staff Exhibit No. 9, of the generating units of FPL? A. Generally, the scheduled maintenance or inspection outages of generating plants follow a planned program of outages to take advantage of the summer season when less capacity on the system is required. However, forced outages will cause deviation from the planned schedule. Forced outages occur in an unpredictable manner and they can and do occur during times when capacity is much needed during the season of peak loads.

The coordinated operation of the Florida Pool makes possible large gains in capacity availability by coordinating the overhaul or maintenance of the units within the Pool.

Q. Mr. Jacobsen. Have you prepared an exhibit consisting of 4 sheets entitled "Electric Energy Transfers Between Florida Power & Light Company and Other Electric Utility Systems During Calendar Years 1954-1964", that show the electric energy transfers between FPL and Jacksonville and F.P. Corp. over the transfer point near White Springs? A. Yes.

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Testimony of Staff Witness, Joseph J. A. Jessel

Q. Would you state your name and address? A. My name is Joseph J. A. Jessel and I reside at 4911-35th Road, North Arlington, Virginia.

Q. By whom are you employed and in what capacity? A. I am employed by the Federal Power Commission as an Electrical Engineer and I am Assistant Chief of the Bureau of Power.

Q. What position did you formerly occupy in the Bureau of Power? A. I was Chief of the Division of Electric Resources and Requirements until April 25, 1965.

Q. What is the Division of Electric Resources and Requirements? A. The Division of Electric Resources and Requirements is one of the four Divisions of the Bureau of Power, the others being the Division of Licensed Projects, the Division of River Basins, and the Division of Rates and Corporate Regulation. The Division of Electric Resources and Requirements is the Division responsible for all electrical work of the Bureau except on rates and corporate matter.

Q. What is the organizational structure of the Division of Electric Resources and Requirements? A. The Division of Electric Resources and Requirements is comprised of the Section of Transmission and Coordination, the Section of Power Requirements and Supply and the Section of Cost Estimates.

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Q. What are the functions of the Division of Electric Resources and Requirements of which you were the Chief?

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A. The Division of Electric Resources and Requirements performs the headquarter's office substantive work of the Bureau of Power. It also gives technical guidance and supervision to the regional offices in matters pertaining to: power requirements and supply, electric power markets, interconnection and operational coordination of electric power systems, electric system maps, power values, and power system data. This Division also makes studies of, and advises the Division of Licensed Projects and the Division of River Basins concerning markets for and value of power from proposed non-Federal and Federal hydroelectric projects, transmission facilities appropriate for inclusion under license, and facilities required to market power from federal projects. This Division also advises and assists the Division of Rates and Corporate Regulation on matters dealing with the operation of electric systems. In addition, it performs the technical work of the Bureau of Power and cooperates with other agencies in matters pertaining to electric power aspects of national defense. Also, it performs all functions and prepares engineering and statistical reports relating to power production and capacity, fuel consumption and stocks, and electric utility system loads.

Q. What are the functions of the Section of Transmission and Coordination of the Division of Electric Resources and Requirements? A. The Section of Transmission and Coordination prepares interconnection and coordination studies involving two or more electric systems and also supervises this activity of the regional offices. It prepares performance data as well as construction and operating cost estimates for transmission lines and substations for use in power value estimates, in power market surveys, and in licensed project matters. It prepares memorandum reports on

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transmission facilities which may be subject to inclusion in licensed hydroelectric projects. It supervises the preparation of maps of principal electric facilities. It directs the collection and compilation as well as analysis of information on the transmission of electric power and on transmission facilities. It supplies expert witnesses in formal proceedings before hearing examiners of the Commission. It coordinates the work involving two or more Divisions of the Bureau and does the work on national defense matters.

Q. What activities did you supervise in your capacity as Chief of the Division of Electric Resources and Requirements? A. I supervised the engineering activities of the Section of Transmission and Coordination, the Section of Power Requirements and Supply, the Section of Costs Estimates, and Special Studies technical staff. The work of these units was under my supervision and control. At times, I delegated some of such supervision to an assistant.

Q. When did you become Chief of the Division of Electric Resources and Requirements? A. I was appointed Chief of the Division of Electric Resources and Requirements on May 27, 1962.

Q. What position did you have before you became Chief of the Division of Electric Resources and Requirements? A. I was Head of the Section of Transmission and Coordination. When the Chief of the Division was absent, I acted as Chief.

Q. Are you an engineer? A. Yes, I am an electrical engineer.

Q. Do you have a formal education in electrical engineering? A. I do.

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Q. What engineering school did you attend? A. I attended the Harvard Engineering School, Harvard University, Cambridge, Massachusetts.

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Q. What, if any, degree or degrees did you receive from Harvard? A. I received the Degree of Bachelor of Science (S.B.) in Electric Engineering magna cum laude in 1931, Master of Science (S.M.) Degree in Electrical Engineering in 1932, and a Doctor of Science (Sc. D) Degree in 1934.

Q. Do you belong to any engineering societies? A. I do.

Q. Would you state what engineering societies you belong to and what grade of membership you hold? A. I am Fellow of the Institute of Electric and Electronic Engineers, a member of the Washington Society of Engineers, a member of the Harvard Engineering Society, a member of the National Society of Professional Engineers, and Chairman of the Nominating Committee of the District of Columbia Council of Engineering and Architectural Societies. I was Chairman of the Council from June 1963 to June 1964. The Council has 34 member organizations. I am also a member of Tau Beta Pi, an honorary engineering society.

Q. Are you a registered professional engineer? A. I am.

Q. Where are you registered? A. I am registered in the District of Columbia and the State of California.

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Q. Do you do any teaching? A. I do.

Q. Where do you teach? A. I teach at the Graduate School of the Department of Agriculture.

Q. How long have you been teaching at that school? A. I have been a member of the faculty since 1942.

Q. What courses have you taught? A. I have taught a course called "Electric Utility Engineering" for many years and am now teaching a review course for the Professional Engineers Examination in Electrical Engineering for use in examinations given in the District of Columbia and neighboring states.

Q. When did you join the staff of the Federal Power Commission? A. I joined the staff of the Federal Power Commission in October, 1934.

Q. At what offices were you stationed while a member of the staff of the Federal Power Commission? A. I was a member of the Washington, D.C. staff of the Commission from October 1934 to August 1936. Then I was transferred to the San Francisco Regional Office where I worked until March 1942 except for a ten month tour of duty in Washington during 1941. I have been at the Washington, D.C. office from 1942 to date.

Q. Did you have any experience in electrical engineering before joining the staff of the Federal Power Commission in October 1934? A. I did.

Q. Would you describe briefly such experience prior to October 1934? A. From June 1928 to October 1928, I worked as Assistant Engineer for the Edison Electric Illuminating Company of Boston. My activities included research on underground cable heating, and general power and economic studies.

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From June 1929 to October 1929, I worked as Associate Engineer for the Boston Elevated Railway on research on rail bonds, contact potentials and ground conductivity.

From October 1929 to August 1933, I worked intermittently for the Harvard Engineering School in the design and construction of equipment for a high voltage laboratory. I also did independent consulting work on electric power matters.

Q. Would you summarize your experience from October 1934 to August 1936 while you were a member of the Washington, D.C. staff of the Federal Power Commission? A. I conducted and supervised work on electric power transmission and also had technical supervision of review of power system statements. I was responsible for electric transmission phase of several comprehensive power reports, such as to the President on Western potential water power projects and a comprehensive interconnection and coordina-

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tion report on the Southeastern Region. I also took part in the first National Power Survey. I was on several special assignments to study operations of power networks.

Q. Would you summarize your experience from August 1936 to March 1942 while at the San Francisco Regional Office of the Federal Power Commission? A. I supervised as well as made electric transmission studies and power market surveys, including those required for license project applications. I was in charge of the electric transmission phases of the report made by the Federal Power Commission on the Bonneville project. I directed and supervised staff on the first headwater benefit study for projects of Pacific Gas and Electric Company and Southern California Edison Company.

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I prepared reports on all aspects of license project applications. I supervised power supply studies and property protection surveys in cooperation with the War Department. I was in charge of the technical aspects of the San Diego Power Market Survey. I prepared or supervised all of the electric phases of the staff report on the Bridge Canyon Project. I prepared special reports as required on transmission matters relating to costs and network performances. I worked with the National Resources Committee and was a member of the Subcommittee on Electric and Gas Utilities of the State Council of Defense for California.

I was assigned temporarily to the National Defense War Power Staff in Washington, D.C. during 1941. I was placed in charge of electrical transmission and operating work. I was a member of the Commission's Southeastern Power Shortage Committee in charge of electric transmission and operating problems at time of the 1941 power shortage. I took part in field work in connection with this power shortage, and in some cases I directed that operating practices and procedures of the electric utilities be revised.

Q. Would you summarize your experience from March 1942 to date while stationed in the Washington D.C. offices of the Federal Power Commission? A. During the 1942-1945 period, I was in charge of the engineering work on War Power Contracts. I was a consultant to the War Production Board. I was in charge of studies on interconnections required to supply war loads. I made studies of material requirements for transmission facilities to serve new war industries. I became Chief of the

Transmission Section of the Electrical Division in charge of all work relating to transmission and electric operations.

During 1945-1951, as Chief of the Section of Transmission and Coordination, I supervised and conducted power market surveys including economic studies of industries, interconnection and coordination studies, and technical and economic studies of power system operations. I prepared economic and operating studies of transmission networks and power supply systems. I supervised studies of technical and economic factors of power using industries, and supervised studies of industry locations. I supervised projections of regional and national economic patterns. I supervised electric facility mapping, cost studies and electric operating studies. I also testified as an expert witness at Congressional and Commission hearings.

From 1951 to May 1962, I was responsible for the technical review of transmission and operating studies made in the Regional Offices of the Commission. I recommended interconnections between two or more electric systems based on staff studies. I was responsible for and supervised reviews of cost estimates and of construction programs of transmission facilities required for contemplated hydroelectric and fuel-electric plants for full utilization of existing and prospective hydroelectric facilities. I directed and supervised studies for determining transmission facilities

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to be included in licensed hydroelectric projects. I was a consultant to and supplied advice to other

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divisions, offices and bureaus of the Commission and to other governmental Federal agencies including defense agencies. I represented the Commission on civil defense and defense mobilization matters.

During this period, I testified as an expert witness at many formal hearings before Hearing Examiners of the Commission.

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Q. What amount does FPL report in FPC Form No. 12 for 1964 as the required reserve capacity for system? A. 404,000 kilowatts.

Q. Of the total amount of 404,000 kilowatts of reserve capacity required, how much did FPL provide in 1964 and how much came from other sources? A. FPL supplied 172,000 kilowatts of reserve capacity and 232,000 kilowatts were reported as available from four Florida systems, namely 80,000 kilowatts from Florida Power Corporation, 63,000 kilowatts from Tampa Electric Company, 46,000 kilowatts from City of Jacksonville and 43,000 kilowatts from Orlando Utilities Commission.

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Q. What is your understanding, if any, of the reasons for the differences between scheduled quantities and metered quantities of FPL? A. Scheduled transactions reflect the amounts of electric power and energy provided by one electric system for the account of another system and they represent the amounts for which payments are made regardless of whether the amounts of electric power

are actually taken as scheduled. Metered transactions reflect the conditions at points of interconnection because of the electrical characteristics of the electrical network, the locations and amounts of generation by all power plants connected to the transmission network, and the locations and moment to moment magnitudes of loads supplied from the network.

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Q. Why do electric utilities such as FPL carry on business in terms of scheduled transactions? A. Electric systems, such as FPL and others, have no control over the actual transfers of electric power and energy over any particular transmision interconnection with another electric system if there is more than one interconnection. Similarly electric utilities, such as FPL and others, have no control over the actual transfers of electric power and energy with any particular electric system if there are interconnections with two or more electric systems, which are also directly or indirectly connected. In each instance this is due to the free flow characteristics of the electric networks. However, all systems operating together on an interconnected basis, schedule the amounts of power and energy transactions among themselves on an hour to hour basis and each sets on its own net interchange controller the net amount of scheduled transactions. Each system measures the actual transfers at each point of connection with another electric system and the differences between scheduled transactions and actual transfers are balanced out as soon as

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practical. In order that the method may work efficiently all interconnected systems must do their share in adhering to schedules as closely as possible.

Q. Would you describe how scheduled transactions are conducted? A. An electric system, such as FPL, agrees to

purchase an amount of electric energy during certain hours of a particular day. Upon such agreement, it is committed to pay for such electric energy regardless of whether or not the amount is actually taken by FPL. To assure to the extent possible that the purchased amount is received, the receiving system, such as FPL, sets its interchange controls at the proper magnitude and usually the net amount received corresponds closely with that scheduled, even though the energy transfer over a particular connection may be as much as three times or as little as one-third of the scheduled amount.

Q. Would you illustrate your answer by an example? A. To illustrate my answer, assume that FPL schedules a receipt of 50 average megawatts or 50 megawatt-hours per hour, of electric power from Florida Power Corporation during the hours 10 a.m. to 12 noon, and makes no schedules for transfers of energy with any of the other electric systems to which FPL is connected. FPL sets 50 megawatts on its system net interchange dial and operates its own generating units automatically in the most economical manner such that the net of transfers at all points of interconnection with other electric systems corresponds as closely as possible, moment to moment, to a 50 average megawatt net input to the system

of FPL. The 50 megawatt schedule is for 60 cycle operation. With deviations in frequency from 60 cycles the net interchange differs from 50 megawatts. The Company's system has a regulating characteristic represented by a tie-line bias curve. It is a curve of area (or system) net interchange plotted against frequency, and is approximated as a straight line. The slope of the tie-line bias curve is a negative quantity. The slope is expressed as the standard frequency of 60 cycles minus the prevailing frequency divided by system net interchange at the prevailing frequency

minus the system net interchange that would obtain at 60 cycles which is the scheduled interchange, in this example, 50 megawatts. The reciprocal of the slope of the tie line bias curve is called bias setting and it is given in terms of megawatts per one-tenth cycle. When the deviation from the normal 60 cycle schedule is matched by the schedule shift, the operation is along the tie-line bias regulating curve, and the actual net interchange in kilowatts corresponds to the scheduled transactions and the system does its share of frequency regulation.

Q. Would you explain what you mean by bias as you used it? A. As I use it in my testimony, bias is the automatic shift of FPL's net interchange schedule with frequency. It is usually expressed in megawatts per one-tenth cycle, or percent of rotating capacity per one-tenth cycle.

Q. Would you restate your explanation of the technique of and reason for tie-line bias control in terms more familiar to the layman?

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A. Yes. The modern electric system is an ever-varying dynamic one; loads and generation are constantly changing moment to moment.

For any particular loading on an electric system all of the electric energy produced by all the generating units is delivered to the common coordinated and integrated modern transmission system from which all of the customers are supplied. This interdependence of generating sources for supplying varying loads accounts for the ever-changing conditions found on electric systems. All generating units connected to a common network experience the same changes in frequency, and all clocks connected to such a network experience these changes in frequency and maintain the same time.

No attempt usually is made to control flows on individual lines because the electric energy flows are determined by

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the electrical characteristics of the network. Only the net of flows over all interconnections is controlled by increasing or decreasing generation so as to maintain interconnection schedules and to maintain frequency as closely as possible at 60 cycles.

Frequency never remains at 60 cycles—it is always a bit above or a bit below, because the loads always dictate and the generation follows to keep the system load and generation in balance and as close to 60 cycles as possible.

Although, as noted, deviations in frequency almost always occur due to the impossibility of matching instantaneous load variations with rapid changes in generation, it is important, for system operation,

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to keep these frequency deviations as small as possible for at least the following reasons:

Most contracts for the sale of electric energy call for delivery of 60 cycle current. Furthermore, the smaller the deviation in frequency, the less will be the transfer of non-scheduled net energy between systems; unnecessary speed-up or slow down in generating equipment will be minimized, and clocks will keep more perfect time; and finally, many precision electrical instruments and industrial operations require that frequency be kept as close to 60 cycles as possible. This is no small matter on the FPL system with its important loads and service at 60 cycles to its municipal and cooperative electric system customers.

Tie line control with frequency bias is the technique used to maintain frequency at 60 cycles on interconnected electric systems operating in synchronism, such as FPL, and is also used to match generation with net system load.

It is important to note that in matching system generation to total system load (including scheduled transfers over interconnections) and in regulating frequency, all 140 electric systems in the Interconnected System Group (in-

cluding FPL), a voluntary association of operating members from electric utility systems, depend in part on each other. It is generally known that each important generating station in the Interconnected System Group is assigned an appropriate share or "band" of generating capacity to be raised or lowered in the event of a system frequency deviation above or below a normal frequency band. The basic

function of modern frequency and tie line control is, of course, that of regulating the total generating output in each individual system or control area in such a way that the total generation will match continuous and as closely as possible the total system load, including scheduled loads on interconnection ties.

Q. Assume for purposes of my question that the operation of the generating units of FPL is such as not to have the system net interchange along the tie line bias regulating characteristic curve of the FPL's electric system. Would you describe what takes place under such a situation? A. For an operating condition such as described, the situation may be considered as being a point below the area-net-interchange vs. frequency curve. For such a point not on the curve, the system generation error, also sometimes called area or system requirement, consists of two components, the first is the amount of deviation of net interchange from the 60 cycle schedule and the second is the amount of automatic shift of net interchange schedule with frequency. The algebraic sum of these two quantities, sometimes called regulating need of the area or system, is the amount by which system generation must be changed for the system of FPL to correct its net interchange and do its share of frequency regulation.

Q. Would you explain why such a difference could exist between scheduled and actual transactions? A. None of the connected electric systems including that of FPL has any control over the actual transfers of power at each

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point of interconnection because of the free flow characteristics of electric networks.

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All that can be controlled on each system having more than one interconnection with other electric systems is the net of transfers into or out of its own system or area. This is particularly so with respect to the electric system of FPL because some of the electric systems to which it is connected, have connections among themselves.

Q. Would you indicate what connections and transactions these other systems have? A. There are substantial transfers of electric power and energy between the electric systems of FPL and Florida Power Corporation, Tampa Electric Company, City of Jacksonville and Orlando Utilities Commission; Florida Power Corporation is also connected to Tampa Electric Company, Orlando Utilities Commission, Georgia Power Company, Gulf Power Company, and Southeastern Power Administration, with each of which it has substantial energy and power transfers.

There also are transfers of electric energy among the following systems:

(1) Tampa Electric Company with Florida Power & Light Company and Florida Power Corporation.

(2) Orlando Utilities Commission with Florida Power & Light Company and Florida Power Corporation.

(3) Georgia Power Company with Alabama Power Company, Gulf Power Company, Duke Power Company, Tennessee Valley Authority, Southeastern Power Administration and others.

Q. What is the nature of electric utility systems?

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A. An electric utility system, such as FPL, is essentially an electromechanical system to which all operating genera-

tors on the interconnected network are interlocked electromagnetically. This means that electric generators, under ordinary operating conditions, run either at exactly the same speed or at a speed ratio such as 1800 or 3600 revolutions per minute for a frequency of 60 cycles. No operating generator can change its speed by itself as long as it operates connected to the network. All generators connected to the same network must follow each other as to speed and frequency whenever there is a change in frequency, and the frequency of all interlocked generators is always exactly the same.

Q. Are all electric systems essentially alike as to electrical, electromagnetic and electromechanical characteristics? A. Yes. Because they are alike, it is possible to have presently existing interconnected operations on a very large scale, extending from the Rocky Mountains to the Atlantic Ocean and from the Canadian to the Mexican border.

Q. Would you detail some of the electric characteristics of electric systems such as FPL and others to which it is connected? A. For all practical purposes and for operation at 60 cycles, electric energy is generated as needed because it cannot be stored in electrical form. Electric energy is delivered where needed at a speed of about 186,000 miles per second. An electric system such as that of FPL and others automatically requires at constant frequency that at every

moment total generation always be equal to total load plus losses; otherwise, there is an unbalance causing a change in frequency. An electric system cannot supply one connected load and not supply another connected load. For any particular loading on an electric system, all of the electric energy produced by all of the generating units is delivered to the common transmission network which acts as a single unit from which all of the customers are supplied. For any change in a load or generation, there is an elec-

trical effect through a change in voltage and current at all generators and at all loads.

Q. Would you detail some of the electromagnetic characteristics of electric system such as FPL and those to which it is connected? A. All stators of the generators are coupled electromagnetically to the prime mover-rotor components of the generating units. As the power output of a generator is increased, there is an angular displacement between a point on the stator and a point on the rotor which initially are opposite to each other electrically at no generation. As the power output on a generator is increased, this angular displacement increases until a spread between these two points of 90 electrical degrees is reached. Further loading on a generator would cause a break in the electromagnetic link between the rotor and stator of the generator and the electric network, and result in a condition called out-of-step. During actual operations this angular displacement may be limited to about 40 electrical degrees because of the swings on the rotors caused by load changes and disturbances on the networks. For each moment to moment change in electric

load on an electric system, there is a change in frequency and an oscillation and change in the angular displacement among the rotors of the generators; and, this causes a swapping of loads among the generators for each change in load.

Q. Would you detail some of the electromechanical characteristics of electric systems such as FPL and those to which it is connected? A. Each generating unit when operating at a speed corresponding to 60 cycles has mechanical energy of rotation stored in its rotating components, which is automatically convertible to electric energy when there is a decrease in frequency and corresponding drop in revolutions per minute. Thus, when a load is added suddenly to an electric system or a generator is taken suddenly out

of service, every generating unit operating on the entire system of FPL and connected systems almost instantly experiences a loss in speed, so that the mechanical energy of rotation of every generator is converted to electric energy. The sum total of the electric energy so obtained through conversion from mechanical energy of rotation, supplies part of the new load or takes the place of some of the lost generation. The amount of assistance from this rotational energy source depends on the mass of the rotating equipment and the difference between the squares of the speeds for the conditions just prior to and just after the change in frequency. This conversion of mechanical energy of rotation has a stabilizing effect such that the frequency reduction is relatively small. If there were no energy of rotation in the generators and other equipment, and if a relatively large power unbalance were suddenly

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to take place, the drop in frequency would be large and the electric systems could fall apart electrically before any action could be taken to restore the balance.

Q. Does FPL receive any benefits because of its connections to a large electrical network, through its ties to neighboring systems? A. Yes it does. By being part of such network, FPL automatically benefits through better frequency and assistance during emergencies, and also realizes savings in spinning reserves and in generating reserve requirements.

Q. Is it important in FPL operations to have as small as possible the deviations in frequency from 60 cycles per second? A. Yes.

Q. Would you explain why it is important to have small deviation in frequency from 60 cycles per second? A. The smaller the deviation in frequency the less will be the transfer of non-scheduled energy between systems; unnecessary speed-up or slow down in generating equipment will be

minimized; clocks will keep more perfect time; many precision industrial operations will be improved; and oscillations between generators will be reduced.

Q. What happens under an abnormal operating condition such as that caused by a sudden loss of a large amount of generating capacity, a short circuit or other operating difficulty? A. Under abnormal conditions there is a significant unbalance between generation and load, which sometimes causes a break in interlocked operations. During usual system unbalances there are relatively large

angular swings between generators which stay interlocked, causing a substantial swapping of loads between them.

Q. What is the usual relation, on an electric system such as that of FPL, between electric load and power supply? In your answer assume that power supply consists of own generation plus gross receipts less gross deliveries over interconnections with other electric systems. A. The electric loads are placed on and taken off the electric system of FPL at the control of the customers. The FPL power resources, consisting of own generation plus gross receipts less gross deliveries, attempt to supply such loads at a frequency of 60 cycles. At a constant frequency of 60 cycles, power supply equals total load plus losses. When the frequency is increasing, power supply almost equals total load plus losses plus energy being stored in the rotating equipment. When the frequency is decreasing, power supply plus energy being received from the rotating equipment almost equals total load plus losses. Total power supply serves total load. There is no practical way of determining the total electric load, hour by hour, from the customers' end. The total hourly load plus losses is determined from a summation of the Company's system hourly generation plus gross hourly receipts from, less gross deliveries to, other electric systems.

Q. What type of system does FPL operate? A. FPL

operates a three phase system as do all other electric utilities to which it is directly and indirectly connected.

Q. How is electric power transmitted in a three phase system?

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A. Electric power is transmitted by each phase of the three phase system.

Q. In what form is electric power transmitted by each phase of a three phase system? A. Electric power is transmitted by each phase in the form of pulses, there being 120 positive pulses per second for a 60 cycle per second system or 120 positive pulses and 120 negative pulses per second per phase for a 60 cycle system. Each of these pulses has a shape that can be represented by a smooth curve that can be closely approximated by the square of a sine curve.

Q. What is the relation of the electric power transmitted by each phase to the total for the three phases? A. If the amount of electric power being transmitted by each phase of a three phase circuit is the same, that is, if the phases are balanced and 120 electrical degrees apart, and the power pulses have the same magnitudes and shapes, the addition of the instantaneous magnitudes of the power pulses of each phase, instant by instant, gives a constant arithmetical magnitude. This is the basis for the usual expression that the numerical magnitude of three phase power is a constant for a balanced three phase circuit.

Q. What is the situation if the three phases are not balanced? A. If the three phases are not balanced, the total of their power instantaneous magnitudes, if plotted as a curve against time, would be represented by a wavy line.

Q. Do three phase generating units have the types of power pulses which you have been describing?

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A. They do for each phase.

Q. Do three phase loads have the types of power pulses that you have been describing? A. They do for each phase.

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Q. Do three phase and single phase loads of customers of FPL have the types of power pulses that you have been describing? A. They do for each phase.

Q. What is a wattmeter? A. A wattmeter is an electrical instrument which measures electric power. The usual wattmeter is an indicating meter which is relatively sluggish and it reads the average power during a short time interval. The hourly average power measurement may be obtained from an attachment to a watt-hour meter or by taking the difference between two successive watt-hour readings, one hour apart.

Q. Does a wattmeter record the positive and negative power pulses? A. No. A wattmeter records the average of the positive and negative power pulses.

Q. Does a watt-hour meter record the positive and negative power pulses? A. No.

Q. Do electric power system operators have records which show the ever-varying dynamic phenomena, characteristics, and operations of electric systems which you described in your testimony? A. No. The frequency chart shows only the net effect of the events which occur in an actual 60 cycle electric system; the net interchange meter only

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indicates short term average effects; and the telemeters on the tie lines with other systems indicate only short term average effects of actual system operations; other meters also give only averages.

Q. What type of meters are usually installed on electric systems such as FPL? A. The types of meters usually installed on electric systems include: indicating ammeters which measure the short term average electric current of each phase in terms of the equivalent direct current; indicating voltmeters which measure the short term average voltage in terms of the equivalent voltage of direct current

circuits; indicating wattmeters which measure the short term average of the three phase power which is equivalent to direct current power; indicating varmeters which measure the short term average of the product of the voltage, current and sine of the angle between the voltage and current of each phase—usually summed for all three phases; watt-hour meters which measure, integrate and add together the average energy of each of the three phases—differences between hourly readings being used to obtain integrated hourly power or average hourly power; varhour meters which measure the hourly reactive power of each phase and add them together, hour by hour; and three phase watt recorders.

Q. Are studies made for electric systems using records obtained by the types

of meters which you described? A. Yes.

Q. What kind of studies are usually made using such records? A. Such records are used to make power flow studies using either the "steady-state method" or the "commingled method" of analysis.

Q. In making power flow studies using either the "steady-state method" or the "commingled method" are there any engineering, technical and other assumptions which underline each method? A. Yes.

Q. Are there any methods and procedures, which apply to each method? Yes.

Q. Do you have an understanding of the engineering, technical and other assumptions underlying each method? A. Yes.

Q. Do you have an understanding of the methods and procedures used in each method? A. Yes.

Q. Would you state the engineering, technical and other bases on which the "steady-state method" is founded? A. The "steady-state method" is based on certain fundamental

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concepts, key assumptions, essential data requirements and specific procedures.

Q. Dr. Jessel, would you please state the basic concepts on which the "steady-state method" is founded? A. The "steady-state method" is founded on the following basic engineering concepts:

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1. When a conductor is carrying electric energy in one direction at any instant there can be no flow in the same conductor in the reverse direction at the same instant.

2. The electric energy entering any section of a circuit, except for losses in that circuit, must be equal to the electric energy leaving that section of the circuit.

3. When energy from different sources is supplied through a common point to two or more loads, the relative proportion from each source in the supplies and in the deliveries to each load is the same.

Q. Would you state the basic assumptions which underlie the "steady-state method"? A. The basic assumptions which underlie the "steady-state method" are as follows:

1. A dynamic electro-mechanical three-phase electric system with ever varying loads, varying generating station outputs and varying frequency is replaced by a static, constant frequency, electric network in which the electric loads, the line loadings and amounts of electric generation are constant during each hour or other time interval under study.

2. Each three-phase alternating current circuit is replaced by a single conductor circuit, with a ground return.

3. Each three-phase alternating current bus structure is replaced by a single conductor bus.

4. A three-phase integrated average hourly kilowatt ratcheted meter

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reading or in lieu thereof a three phase indicating watt-meter reading is equivalent to the average hourly kilowatt reading for a single conductor circuit.

5. Power flow may be tracked through each single conductor bus of the static, constant frequency, electric network, using the point to point tracing principles of direct current circuits with static power sources and with steady power flows.

6. All kilowatt data are for unity power factor loads and sources of power supply.

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Q. Has the "commingled method" been used in any power flow studies presented at formal proceedings before Hearing Examiners of the Commission? A. Yes.

Q. Would you identify the proceedings in which the "commingled method" has been used in power flow studies? A. The "commingled method" has been used in power-flow studies in the Penn Water proceeding, Docket No. IT-5915, reported in FPC Reports, Volume 8, page 1; and in the Wisconsin-Michigan proceeding, Docket No. E-6268, reported in FPC Reports, Volume 10, page 170.

Q. Would you state on what the "commingled method" is founded? A. The "commingled method" is based on certain fundamental concepts, key assumptions, essential data requirements and specific procedures.

Q. Dr. Jessel, would you please state the basic concepts on which the "commingled method" is founded?

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A. The "commingled method" is founded on the following basic engineering concepts:

1. When a conductor is carrying electric energy and power in one direction at any instant there can be no flow

in the same conductor in the reverse direction at the same instant.

2. The electric energy and power entering any section of the circuit, must be equal to the electric energy and power leaving that section of the circuit.

3. When energy and power from different sources is supplied through a common point to two or more loads, the relative proportion from each source in the supplies and in the deliveries to each load will be the same.

Q. Would you state the basic assumptions which underlie the "commingled method"? A. The basic assumptions which underlie the "commingled method" are as follows:

1. A dynamic electro-mechanical three-phase electric system with ever varying loads, varying generating station outputs and varying frequency is replaced by a static, constant frequency, electric network in which the electric loads, the line loadings and amounts of electric generation are constant during each hour or other time intervals under study.

2. Each three-phase alternating current circuit is replaced by a single conductor circuit, with a ground return.

3. Each three-phase alternating current bus structure is replaced by a point connecting all incoming and outgoing single conductor circuits.

4. A three-phase integrated average hourly kilowatt ratcheted meter reading, or in lieu thereof a three-phase indicating wattmeter reading, is equivalent to the average hourly kilowatt reading for a single conductor circuit.

5. When two or more single conductor circuits are supplying electric power to the same junction point, such power is commingled uniformly and the outgoing amount of power

over each single conductor circuit has the same proportions of power as the incoming single conductor circuits; that is, if circuit A contributes 60 percent of the incoming power to the junction point and circuit B contributes 40 percent of the incoming power to the junction point, then the distribution of power in each outgoing circuit is comprised of 60 percent A power and 40 percent B power, uniformly commingled.

6. All loads and power supply sources do not have the same power factor.

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Q. How would you describe the "steady-state method" and the "commingled method" of representation of an actual electric power system? A. Each method is a rough approximation and simplification of an actual electric power system.

Q. Which of the two methods, in your view, more nearly represents an actual electric power system? A. The "commingled method" wherein an actual three phase bus is treated as a point, more nearly represents an actual three phase electric power system because it, in effect, allows for the differences, instant to instant, among the electrical characteristics of sources of power supply and loads, and provides for power contributions to electric loads more nearly as they actually take place.

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Rebuttal Testimony of Joseph J. A. Jessel

Q. Would you please state your name? A. Joseph J. A. Jessel.

Q. Did you read the testimony of Mr. Ernest L. Bivans? A. I did.

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Q. Please refer to the first question and answer on page 38 of the prepared testimony of Mr. Bivans. Are you familiar with the "system studies method"? A. Yes. It is just another steady-state approximation of an actual ever-varying, dynamic electric system. It is used for system planning purposes.

Q. Does the "system studies method" have any concepts which are peculiar to it? A. Yes. This "system studies method" includes the mathematic concept of dividing actual electric power into real and reactive components.

Q. What type of data are recorded in the "system studies method"? A. At each bus, the voltage and phase angle are recorded. Also, for each circuit connecting to the bus, the real and reactive power is recorded. In this method, no data are shown of real and reactive power flows through the bus. In all studies that I have seen, the bus is treated as a point because of absence of data within the bus.

Q. Please refer to the first question on page 40 of the prepared testimony of Mr. Bivans and continue to answer to the second question on page 41. Are you familiar with the MW and MVAR method of analysis discussed by Mr. Bivans? A. I am.

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Q. Would you state your views on this method as used in the testimony to which you have been referred? A. The

MW and MVAR method is based on a mathematical concept of subdividing actual power into two average components. This method is not as representative of actual system operating as is the "commingled method" wherein the bus is treated as a point.

Q. Please refer now to the third question and answer on page 41 of the prepared testimony of Mr. Bivans—do you have the reference? A. I do.

Q. Do you agree with the statement of Mr. Bivans? A. No. The system studies method has been used for system planning and system operating purposes. To the best of my knowledge, the "system studies method" has never been used in any proceeding involving the jurisdictional question under Part II of the Federal Power Act.

Q. Please refer to the first question on page 43 and continue to the answer to the third question of the prepared testimony of Mr. Bivans. What types of data are used in the power flows described by Mr. Bivans? A. The data used are average figures which are equivalent to direct current values. These figures are merely steady-state approximations of actual alternating current power quantities.

Q. Would you refer to the first question on page 44 and continue to the answer to the first question on page 45 of the prepared testimony of Mr. Bivans. Do you have the reference? A. I do.

Q. What are your comments, if any, on the analysis to which you are referred? A. This is merely an application of the "steady-state method" of analysis. It is a rough approximation of an actual ever-varying dynamic electric system. This analysis does not prove that energy from Deland West does not get to the Florida Power & Light Company system.

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Rebuttal Testimony of Cleve R. Jacobsen

A. Please state your name. A. My name is Cleve R. Jacobsen.

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Q. Mr. Jacobsen. Is the definition of "power pool" as defined in your Exhibit No. 29 necessarily a FPC Staff definition? A. No. It is a definition that in my opinion described the "Florida Pool," and is similar to the definition of "power pool" listed in a pamphlet published by the Edison Electric Institute, dated 1961, "Glossary of Electric Utility Terms". There are many "Pool" categories. I will briefly describe a few below.

(1) Interconnected electric utility systems with tie-in lines normally in operation so that spinning reserve is automatically available during the first few seconds following a disturbance.

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(2) Voluntary supply of power to other systems to meet emergencies but with or without obligation to deliver power within a fixed time after occurrence of emergency.

(3) Obligatory pool assistance to be made available with no more delay than, say, five minutes.

(4) Power transactions contracted for in advance and not dependent on daily or hourly fluctations in the cost of producing power.

(5) Occasional or regular daily or hourly interchange of power for the purpose of reducing costs, whether or not all areas in the pool are under control of central load dispatch office.

(6) Free flowing ties with generating capacity under control of a central load dispatch office.

(7) Joint planning of some or all of the major transmission lines and generating stations in order to reduce overall costs by staggering of construction schedules, sharing reserve capacity, coordinating maintenance schedule, etc.

The overall coordination of the "Florida Pool" is attained by mutual and cooperative agreement. There is no centralized directorate or administrative nucleus to direct day-to-day operations; however, the association of the adjacent power groups that comprise the "Florida Pool" is, as the case of many "pools" in the United States predicated upon informal understandings and procedural arrangements.

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Q. Mr. Jacobsen. Does the definition of "power pool" appear in the Federal Power Commission's (FPC) "Glossary of Important Power and Rate Terms Abbreviations, and Units of Measurement"? A. Yes.

Q. Will you state the definition of "power pool" as it appears in the FPC Glossary of abbreviations? A. Yes. It is found on page 12 and states, "134. *Power Pool, Electric*—two or more electric systems interconnected and operating on a regional basis."

Q. Mr. Jacobsen. Do you know of any electric power pools in the United States that function without a formal agreement or contract but more or less operate on a cooperative basis? A. Yes. Among others, the Northwest Power Pool is such a power pool.

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Staff Counsel: Mr. Examiner. The Staff requests that the exhibit as identified by Mr. Jacobsen be marked for identification as Staff Exhibit No. 32.

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Q. Mr. Jacobsen. Please describe the diagram, page 1, of this exhibit. A. This is a simplified one line diagram of a portion of the F.P. Corp. System that among other things, shows transmission lines, substation buses, and direction of electric power flow. The purpose of the diagram is to show the transmission lines and substation buses over which power flowed from FPL, commingled with F.P. Corp. generated electric power and flowed over F.P. Corp. 120kv transmission lines into the Georgia Power Company system. The arrows adjacent to the transmission lines indicate the direction power flowed each day and hour that was analyzed. The color of the arrow, as designated in the legend, indicates whether the power that flowed was FPL generated power flow, commingled (FPL and F.P. Corp.) power flow or unidentified power flow.

Q. Mr. Jacobsen. Please describe the tabulated data shown on page 2 of Staff Exhibit No. 32. A. This page of tabulated data indicates, among other things, the 3 days and hours of these days, that power flow was studied. The data supports the conclusion that FPL generated power and F.P. Corp.

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generated power commingled at the F.P. Corp. Turner Plant and flowed over the F.P. Corp.'s 120 kv transmission lines into the Georgia Power Company System. Page 2 also shows the direction and magnitude of power flow over specific transmission lines of the F.P. Corp. and FPL Systems.

Q. What information did you use in preparing Staff Exhibit No. 32? A. The information that I used was obtained from System maps in FPC Forms No. 12, Power System Statements, filed by FPL and F.P. Corp., and F.P. Corp. daily operating reports.

Q. What F.P. Corp. daily operating reports did you use in preparing Exhibit No. 32? A. I used copies of the "Turner Plant-Daily Operation Report"; the "Jasper Sub-

station-Daily Operating Report"; the "Silver Springs Substation-Daily Operating Report"; and the "Fort White Substation-Daily Operating Report" for July 8, August 12 and August 17, 1964. There was a total of 12 reports studied.

Staff Counsel: Mr. Examiner. The Staff requests that the 12 daily operating reports described by Mr. Jacobsen be marked for identification as Staff Exhibit No. 33.

Q. Where did you obtain the F.P. Corp. daily operating reports? A. These reports were obtained from F.P. Corp. earlier this year for study in connection with the preparation of direct testimony filed in this proceeding with the exception of the "Jasper Substation-Daily Operating Report" which was obtained from F.P. Corp. during the week of August 23, 1965.

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Q. Mr. Jacobsen. Has the primary information shown on the face of these reports of Exhibit No. 33 been discussed in testimony previously given in this proceeding? A. Yes. Mr. Clark, a FPC Staff witness, describes these reports in detail beginning on page 4 of his testimony.

Q. Mr. Jacobsen. Referring to Staff Exhibits No. 32 and 33 will you describe your analysis of power flow? A. Yes. For the purpose of this analysis, only the two 120kv transmission tie-line interconnections between Georgia Power Company and F.P. Corp.'s Jasper substation were considered. These tie-line interconnections are the Kettle Creek-Jasper and Pine Grove-Jasper 120kv transmission tie-lines. On days and hours as shown on Staff Exhibit No. 32 the "Turner Plant-Daily Operation Report" shows that power flowed from the F.P. Corp. Sanford Plant bus to the Turner Plant bus over the Sanford-Turner 120kv transmission line, reference Point 1. The "Turner Plant-Daily Operation Report" shows for the same days and hours that (F.P. Corp. and FPL) commingled power flowed from the Turner Plant bus to the Silver Springs substation bus over

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the Turner Plant-Silver Springs 120kv transmission line, reference Point 2. The "Silver Springs Substation Daily Operating Report" for the same days and hours show that (F.P. Corp.-FPL) commingled electric power was flowing into the Silver Springs substation bus over the Turner Plant-Silver Springs 120kv transmission line, reference Point 3. It also shows that for the same days and hours.

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(F.P. Corp.-FPL) commingled power flowed out of the Silver Springs substation bus toward the Fort White substation bus over the Silver Springs-Fort White 120kv transmission line, reference Point 4.

The "Fort White Substation-Daily Operating Report" shows for the same days and hour that commingled (F.P. Corp.-FPL) electric power flowed into the Fort White substation bus from Silver Springs substation over the Fort White-Silver Springs 120kv transmission line, reference Point 5. It also shows that commingled (F.P. Corp.-FPL power flowed out of the Fort White substation bus over both the east and west circuits to the Jasper substation over the Fort White-Jasper 115kv transmission lines, reference Points 6 and 7.

The "Jasper Substation-Daily Operating Report" shows for the same days and hours that commingled (F.P. Corp.-FPL) power flowed from Fort White substation over both the east and west circuits over the Fort White-Jasper 120kv transmission lines, reference Points 8 and 9. It also shows for the same days and hours that commingled (F.P. Corp.-FPL) power flowed out of the Jasper substation bus to the Georgia Power Company System over the Jasper-Pine Grove and Jasper-Kettle Creek 120kv transmission tie-lines, reference Points 11 and 12.

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Q. Mr. Jacobsen. Have you read Mr. Bivans' testimony beginning on page 30 related to his Exhibit No. 4 which is

a diagram entitled "Single Conductor Diagram" and his testimony beginning on page 32 describing his method of making a power flow analysis? A. Yes.

Q. Do you concur in Mr. Bivans' testimony? A. No.

Q. Do you have any comments on his testimony? A. Yes. My analysis of electric power flows from Georgia Power Company to FPL as shown on my Exhibits 18 and 19 and electric power flows from FPL to Georgia Power Company as shown on my Exhibits No. 32 and 33 does not require the rigorous approach that Mr. Bivans has suggested. Mr. Bivans appears to be describing a method of identifying power flow to each individual load. Whereas my analysis is concerned with electric power flow from point to point. One point being the tie-points on the Georgia Power Company tie lines to the Jasper substation and the other point being the tie-point on the Turner-Sanford tie line.

My analysis involves a straight through electric power flow between Georgia Power Company and FPL over F.P. Corp. high voltage transmission lines. The magnitude of these power flows is large enough that the load taps from the major substations used in my analysis do not affect the results of the study. My analysis also considers the bus as a point or reservoir and that electric power is commingled on the buses.

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In making my analysis I was aware of the flow of power from the Suwannee Plant bus to both the Jasper substation bus and to the Fort White substation bus, where it commingled with power on these buses. I have taken into consideration this power flow and have indicated it on the diagram in my Exhibit No. 18. I have shown the power flow from the Suwannee Plant as unidentified; however there are times that power flowed into the Suwannee Plant bus from Scholz Plant bus which is often commingled out-of-state electric power from Alabama Power Company.

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I have also studied and noted on the diagram in my Exhibit No. 18 that power flow on the two lines from Fort White substation to the Inglis Plant is always commingled power flowing out of the Fort White substation bus toward the Inglis Plant for the days and hours studied. This flow does not affect the results of my analysis.

My analysis shows that Georgia Power Company out-of-state electric power is commingled with the F.P. Corp. Suwannee Plant generated power (which may be commingled with out-of-state power from the Scholz line or the Pine Grove-Suwannee line) at the Jasper substation bus and flows southward at the speed of 186,000 miles per second to the Turner Plant where it is further commingled with F.P. Corp. generated power at Turner Plant, and flows on to the FPL Sanford Plant over the Turner-Sanford tie line.

Q. Mr. Jacobsen. Have you examined Mr. Bivans' Exhibit No. B-6 and studied his testimony pertaining to his exhibit beginning with the last question on page 43?

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A. Yes.

Q. Do you concur in his testimony? A. No. Primarily because he has considered the Turner Plant bus as a transmission line instead of a point or reservoir.

Q. Mr. Jacobsen. In your study and analysis did you consider the substation buses as a point or reservoir, or did you treat the substation buses as a transmission line? A. I considered the substation buses as a point or reservoir.

Q. Do you know of any electrical engineers besides Dr. Jessel who treat the bus as a point or reservoir and have so testified in proceedings before the Federal Power Commission? A. Yes. Mr. Stanley W. Roland, FPC staff witness in the *Penn Water* proceeding, FPC Docket No. IT-5915 and Dr. William Lewis, a witness in the *Indiana &*

Michigan Electric Company proceeding, FPC Docket No. E-7089. Dr. Lewis was a professor of Electrical Power Systems at Illinois Institute of Technology in Chicago, Illinois.

Q. Mr. Jacobsen. If the Turner Plant bus was treated as a point or reservoir, would this treatment make Mr. Bivans' analysis of power flow on this bus valid? A. His analysis would not be valid if he treated the bus as a reservoir or point.

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Testimony of Ben H. Fuqua

Q. Please state your name and address. A. My name is Ben H. Fuqua. I reside at 1530 San Rafael Avenue, Coral Gables, Florida.

Q. What is your position with the Florida Power & Light Company? A. Vice President.

Q. Please give your education and employment background. A. I am a graduate of the University of Florida, and received a Bachelor of Science degree with a Scientific Group major in such subjects as mathematics, chemistry and physics. I also attended Duke University and Florida State University, specializing at the latter institution in public administration. From 1933 until 1946, I was in the investment banking business in Florida, except for the years 1942-1945 inclusive, when I served in the United States Navy. I was a Member of the Florida Legislature from Manatee County in the 1937 Session. I was elected Chief Clerk of the Florida Legislature in 1938 and served in that capacity during the 1939 and 1941 Sessions, continuing in that office until I entered the

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United States Navy. From 1947 until 1949 I was Executive Assistant and Legislative Secretary to The Honorable

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Millard F. Caldwell, who was then the Governor of Florida. I was employed by the Florida Power & Light Company on January 1, 1949 and have been with that Company continuously since that date. I was elected a Vice President of the Company in the spring of 1956 and have general charge of what is known as the "Corporate" affairs of the Company. These duties would include such matters as claims, taxes, right-of-way, the administration of damage suits, condemnation suits, administration of relations and contacts with various governmental agencies, including regulatory bodies.

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Q. Will you please recite the history of this matter leading up to the present Order of Investigation by the FPC.
A. During the years 1941 and 1942, the FPC determined that certain emergencies existed under Section 202(c) of the Federal Power Act and ordered on their own initiative certain interconnections between Florida Power & Light Company and other electric suppliers, notably the Florida Power Corporation. Chairman Leland Olds wrote at the time that such interconnection "will not in and of itself bring the Florida Power & Light Company within the jurisdiction of the Federal Power Commission."

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A. This interconnection was in operation for more than a decade, until in 1953 the FPC made a finding that the emergency no longer existed and stated that they intended to

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terminate the interconnection orders.

Prior to such termination, however, the Florida Power & Light Company was given an opportunity to appear before the Commission Staff. At that time, representatives

of the Company, of which I was one, were able to demonstrate to the satisfaction of the Staff that the interconnections were operated in such a way so that there would be no occasion for the Staff to recommend the initiation of proceedings to have Florida Power & Light Company determined to be a public utility under the Federal Power Act by reason of the maintenance of the interconnections, so long as the stated operating conditions existed. Actually the issue of the possible interstate flow of power revolved around only one interconnection, viz. between Florida Power & Light Company and the Florida Power Corporation at White Springs, Florida. This emergency interconnection has since been dismantled as testified to by Mr. Bivans. The interconnection near Sanford was not considered a factor since it is located between two large generating plants, one belonging to Florida Power & Light Company and the other owned by the Florida Power Corporation, and it is more than 150 miles from the Georgia state line.

The meeting between representatives of Florida Power & Light Company and members of the FPC Staff occurred in

January 1954. On January 25, 1954, I wrote to the FPC setting forth Florida Power & Light Company's understanding of that meeting, and on February 24, 1954, the Secretary of the FPC replied:

> "Your letter implies that the staff had agreed that the continued operation of the interconnections would not make Floride Power & Light Company a 'public utility' under the Federal Power Act. This, the staff feels, is not quite accurate. Its understanding was that you felt from the data that you then had for the operations during the month of December, 1953, that no energy flowed over the White Springs interconnection

in interstate commerce, with the possible exception of very infrequent occasions in which very minor amounts of energy might conceivably be traceable interstate, and that such flows would be even more trivial on an annual basis. The staff's position was that if that were true, and so long as that condition continued, there would be no occasion for the staff to recommend the initiation of proceedings to have Florida Power & Light Company determined to be a 'public utility' under the Federal Power Act by reason of the maintenance of this interconnection. Of course, as you were advised, the staff's position is in no way binding upon the Commission."

In July 1954, the FPC issued an order terminating the prior emergency orders requiring interconnection of facilities.

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A. Nothing more transpired concerning these interconnections or the matter of FPC jurisdiction until a letter was received from the FPC by Florida Power & Light Company dated October 3, 1963. This letter stated that reports made by the Company to the FPC indicated that it "currently transmits or interchanges and sells electric energy in interstate commerce at wholesale for resale," and that there were no rate schedules on file with the Commission. It was stated that the matter was being brought up prior to Staff recommendations for possible Commission action so that the Company could file its appropriate rate schedules or within 30 days give the legal and factual bases why the Company did not agree with the Commission Staff's conclusions. The Florida Power & Light Company stated that it did not agree with the Staff's conclusions, and after some postponement, two conferences were

held with the Staff concerning this issue, in which I participated.

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Q. Mr. Fuqua, you stated that Florida Power & Light Company undertakes to stand on its own feet with regard to its energy requirements and reserves. Why is this done? A. Normal weather peaks occur usually in the period August to October each year. Historically, these are the months which show the largest incidence of severe hurricanes during all of the time that records are available.

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A. It can, therefore, be readily seen that with our peak loads and the peak of the hurricane season occurring simultaneously, it becomes a matter of dire necessity for us to be able to stand on our own feet with regard to our energy requirements and reserves. Hurricanes are unpredictable in their behavior. As a matter of fact, it is possible for us, in dire necessity, to segment or sectionalize our Company so that each segment or section could be self sufficient and stand on its own resources. These segments or sections generally would be the west coast, the southeast coast, which accounts for approximately 75 percent of our load, and, finally, the northern region.

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Q. Have you an estimate of what it would cost Florida Power & Light Company initially and on an annual basis afterward if it became subject to FPC jurisdiction under the Federal Power Act? A. Yes, I have.

Q. Please state what the estimates are and how they were made. A. I have two documents on these subjects. The first one is entitld "Estimated Initial Costs of Making

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Minute Property Evaluations and Setting Up New Accounting Techniques Under Federal Power Commission Jurisdiction." This estimate was prepared by our staff, based on the experience of other companies with whom we have been in contact. It is obviously an expensive requirement. In fact, in the case of our neighboring utility, the Florida Power Corporation in St. Petersburg, Florida, it is our understanding that at the time they made an inventory of the then $40 million plant account to carry out the accounting refinements required by the FPC, it took the equivalent of 50 people a

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period of three years to accomplish this. Thus, you can see that with our plant account in service of about $840 million as of June 1965, such an undertaking would be very costly. Based on the estimation and information gathered by our staff, we conclude that this figure could amount to as much as $4 million to $6 million.

The second document is entitled "Estimated Annual Costs of Maintaining Accounting Records Under FPC Regulation." This document sets forth in detail the breakdown of these estimated costs if we are forced to follow the present refinements in accounting required by the FPC. This estimated amount is $516,750. This total annual cost would cover only the salaries and fringe benefits of additional personnel needed to carry on the necessary accounting records.

In addition, we are advised that the FPC has now issued even newer procedures and schedules of audit programs. We have seen some of the outlines of the scope and character of these examinations. They are most minute and exhaustive in nature, and serve only to duplicate and overlap similar examinations and audits of the Florida Public Service Commission. They obviously will require several FPC Staff members, tying up a large number of

Florida Power & Light Company personnel and will require

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several months to complete. There is no indication as to how often these audits will be made. The tying up of our key personnel in order to supply data, in any event, is a great additional burden of expense, the amount of which we are unable to estimate.

Mr. Meriman: Mr. Examiner, I ask that there be marked for identification as Exhibit No. 40 and Exhibit No. 41 the documents identified by Mr. Fuqua, the first relating to estimated initial costs and the second relating to estimated annual cost.

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Testimony of Ernest L. Bivans

Q. Please state your name and address. A. Ernest L. Bivans, 380 Glenridge Road, Key Biscayne, Florida.

Q. What is your position with the Florida Power & Light Company? A. Assistant Chief Engineer.

Q. Please give us your education and employment background. A. I graduated from the University of Florida in May, 1942 with a Degree of Bachelor of Electrical Engineering. Upon graduation, I entered the service of the U. S. Army Signal Corps. In the service I attended radar schools at Camp Murphy, Florida; Radiation Laboratory M.I.T. in Boston; and at Camp Evans in Belmar, New Jersey. I served one year in Panama where I wasin charge of operating several radar units. I also served one and one-half years in Europe operating various types of radar.

In November, 1945 I was employed by the Florida Power & Light Company as a Junior Engineer. During the next several years I progressed to Assistant Engineer, Engineer, Senior Engineer and Section Head of System Plan-

ning. During this period I performed various phases of engineering which included system planning for distribution, transmission and generation facilities, preparation of construction budgets, underground engineering, distribution, transmission and substation engineering, relay engineering, preparation

and maintenance of construction standards for transmission, distribution and substation facilities and preparation and maintenance of the Standard Material Catalog.

In 1951 I attended in Schenectady, New York, the General Electric Company's one-year course in "Advanced Power System Engineering." In March 1960 I was promoted to my present position of Assistant Chief Engineer.

Q. Do you belong to any engineering societies, and, if so, please name them and the grade of membership you hold? A. I am a registered Professional Engineer in the State of Florida, a member of the National Society of Professional Engineers, a senior member of the Florida Engineering Society, and a senior member of the Institute of Electrical and Electronic Engineers.

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A. As pointed out by Mr. Jacobsen, FPL operates solely within the State of Florida. All of the dispatching of FPL's generation is done by FPL in Florida and FPL controls no generation owned or operated by anyone else. Further, FPL has no firm power contracts to buy or sell either directly or indirectly from or to any company in or outside the State of Florida. FPL is interconnected only with Florida Power

Corporation (F. P. Corp.), Tampa Elecrtic Company (TEC), the Orlando Utilities Commission (Orlando), and the City of Jacksonville (Jacksonville).

To aid the Examiner in understanding the FPL system and the points at which it is interconnected with the above-mentioned systems, I will refer to a map entitled "Substation and Transmission System, Florida Power & Light Company," dated April 21, 1965.

Mr. Meriman: Mr. Examiner, I ask that there be marked for identification as Exhibit No. 42 (B-1) the map identified by Mr. Bivans.

Q. Mr. Bivans, please describe this map A. The legend appearing in the lower middle part of the map identifies the facilities shown. The points of interconnection are shown in green circles, The two interconnections with Jacksonville are shown in the upper right portion of the map. The two interconnections with F. P. Corp. at Sanford and Brevard appear on the right side of the map at about the middle of the page. The sole interconnection with Orlando is shown on the map above and slightly to the right of Brevard, and the sole interconnection with TEC is on the west side of the State at the Hillsborough-Manatee County line above Bradenton. This appears in about the center of the map.

Q. How far from the Georgia-Florida State line is the Sanford interconnection between FPL and F. P. Corp.? A. Approximately 180 miles, calculated from transmission line mileages.

Q. Do F. P. Corp., TEC, Orlando or Jacksonville own or operate any electric facilities of any sort outside of the State of Florida? A. Not to the best of my knowledge.

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Q. Mr. Bivans, in his testimony Mr. Jacobsen referred to the Florida Operating Committee. Who are the members and what is the function of that Committee?

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A. The Florida Operating Committee is comprised of FPL, F. P. Corp., and TEC. The Committee was set up in 1959 as an informal group to consider mutual operating problems relating to the interconnected operation of the three systems. Representatives from Orlando and Jacksonville have attended meetings of the Committee. The Committee does not have any authority to make contracts, supervise the operations of the systems of any of the members, or to implement its recommendations or studies.

Q. On page 7 of his testimony, Mr. Jacobsen defined "electric system." Please read that definition. A. He defines "electric system" as "the physically connected generation, transmission, distribution, and other facilities operated as an integral unit under one control, management, or operating supervision."

Q. On page 80 of his testimony Mr. Jacobsen described Staff Exhibit No. 29, a 5-page document entitled "Definition of Terms Electric Power Systems." Are you familiar with this exhibit? A. Yes, I have read the document.

Q. Please read the definition P2 covering "Power System." A. "A power system is a group of one or more generating sources and/or connecting transmission lines operated under common management or supervision to supply a load."

Q. Now, would you read definition I7 covering "Interconnected System". A. "An interconnected system consists of two or more individual power systems normally operating in synchronism."

Q. Now read definition P1 covering "Power Pool". A. "A power pool is two or more electric systems interconnected and coordinated to supply power in the most economical manner for their

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combined load requirements and maintenance program."

Q. Now, Mr. Bivans, which of these definitions describes

the FPL system? A. Power system, or what Mr. Jacobsen calls an "electric system".

Q. Which of these definitions describes the operations of the systems comprising the Florida Operating Committee? A. Interconnected System.

Q. Why do you say this? A. By definition P1 referred to above, a power pool is "two or more electric systems interconnected and coordinated to supply power in the most economical manner for their combined load requirements and maintenance program", whereas, an interconnected system consists of two or more individual power systems normally operated in synchronism. FPL, F. P. Corp., TEC, Orlando and Jacksonville each operate their own individual system in the most economical manner consistent with their own individual requirements and policies and not under the supervision or direction of the Florida Operating Committee. All that the Florida Operating Committee does, that in any way falls within the definition of "Power Pool", is to coordinate spinning reserves among the five interconnected systems, and to coordinate overhaul schedules of the five systems so that too many large units are not out of service at the same time. This is on a voluntary basis with the Committee having no enforcement power.

Q. At page 25 Mr. Jacobsen discusses transactions betwen FPL and TEC, and FPL and F. P. Corp. Does FPL buy firm power from, or sell firm power to, either of these companies or Orlando or Jacksonville? A. No, all scheduled power transactions are on a so-called "when, as and if basis".

Q. Does FPL buy economy energy from, or sell economy energy to, F. P. Corp., TEC, Orlando or Jacksonville? A. No, it does not.

Q. Mr. Bivans, at numerous places in his testimony, commencing at page 7, Mr. Jacobsen refers to the Florida

Operating Committee as the "Florida Pool", which he states is comprised of FPL, F. P. Corp., TEC, Orlando and Jacksonville. He also notes that in some minutes of meetings of the Florida Operating Committee included in Exhibit No. 3, the term "Florida Pool" is used. Please comment on this, and just so there will be no misunderstanding, please define the term "Florida Pool". A. Although neither the Florida Operating Committee nor the five interconnected electric systems fits Mr. Jacobsen's definition of "power pool" set forth in Staff Exhibit No. 29 and quoted above by me, I am aware that some people have referred to the five interconnected electric systems—FPL, F. P. Corp., TEC, Orlando and Jacksonville—as the "Florida Pool". There are no "pooling" or multiparty contracts or commitments among these systems. It is an informal arrangement for the purpose of helping each other in cases of emergency. Our participation in the so-called "Florida Pool" does not imply or mean that we have any firm power contracts to buy from, or sell to, either directly or indirectly from or to any company in or outside the State, or that we are dependent upon other companies for our requirements, or that our system is dispatched from a central office with other systems. Any difference of opinion depends upon the definition used. It is clear that the Florida interconnected system is only that and cannot be a "pool" under the Staff's own P1 definition of "power pool".

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Q. How is such inadvertent accounted for? A. Each system is responsible for the accounting of its own inadvertent energy flow to and from other systems. This is made evident insofar as FPL is concerned by Exhibit No. 26, "System Dispatchers Interchange Log", which covers all interchange transactions hour by hour between FPL and

other systems both scheduled and inadvertent. It also shows FPL's cumulative inadvertent balance.

Q. What does F. P. Corp. do with regard to accounting for daily inadvertent energy flow? A. In order to eliminate the necessity of each of the five dispatchers having to check with the dispatchers of the other systems to verify that the inadvertent balances for all systems totals zero, F. P. Corp. agreed to coordinate the reporting of inadvertent for all systems. Each of the system dispatchers reports to the F. P. Corp. system dispatcher three times daily (8 a.m., 10 p.m. and 12 Midnight) the following balances: net interchange, scheduled interchange and inadvertent interchange.

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F. P. Corp. records these balances and then checks to see that the total of the inadvertent balances for all five systems is zero. If it is not, F. P. Corp. contacts the other systems in order that the error can be located and corrected.

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FPL generating expansion has always been planned and installed solely by FPL to serve its own load. All transmission lines which have been constructed by FPL that do not connect with facilities of a neighbor are planned and constructed solely by FPL without consultation with any member of the Florida Operating Committee. Any new tie line FPL has constructed connecting with a neighbor has been built pursuant to an agreement solely between the two companies, independent of the Florida Operating Committee. An informational report on construction status of new plants and transmission lines is made at meetings of the Florida Operating Committee.

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A. I have prepared a curve showing FPL system load as compared to FPL generating capability for the 10-year period 1960 through 1969, which shows the past history as well as our forecast of loads and generating capability for the immediate future.

Mr. Merriman. Mr. Examiner, I ask that there be marked for identification as Exhibit No. 43 (B-2) the one-page curve entitled "Florida Power & Light Company—Comparison of Generating Capability and Peak Loads (1960-1969)", identified by Mr. Bivans.

Q. Mr. Bivans, what does this curve show with regard to the relationship of system load and generating capability? A. It shows that FPL has projected its generating capability to meet its loads without dependence upon other electric systems in the State of Florida or systems outside the State of Florida. For example, in the spring of 1965, FPL added two 432,000 kw units, one at Port Everglades and the other at Cape Kennedy. Therefore, the present capability is about 850,00 kw in excess of the forecasted Summer peak load for 1965 and about 600,000 kw in excess of the forecasted cold weather peak for the coming winter. FPL also has under construction two 432,000 kw units at Turkey Point, south of Miami, one unit of which is scheduled to be in operation November, 1966 and the second of which is scheduled

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to be in operation in November, 1967. A 432,000 kw unit is under consideration for operation in the fall of 1968 to meet the 1969 loads. As you can see, FPL plans to have installed sufficient capacity to give firm capacity for its summer and normal winter weather peak loads and to have total capacity for short time extreme cold weather peaks (which do not occur every year). It is clear from Exhibit No. 43 (B-2), the FPL has had adequate capacity for all loads that have been experienced.

Q. Mr. Bivans, how does FPL design its system generating capacity to meet cold weather peaks? A. On page 26 of FPL's Form 12 for 1964, there is a statement that "Our system peak usually occurs in winter and is influenced to a considerable extent by temperature. No reserve capacity is provided to meet peaks caused by extreme cold weather."

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Q. In the case of the loss of about 580 mw of generation by a midwestern utility on February 17, 1965, discussed by Mr. Jacobsen on page 60 of his testimony, what was FPL's biased scheduled net interchange approximately 30 seconds after the initial frequency drop? A. As shown in Exhibit No. 8A, the FPL frequency was 59.98 cycles immediately following the momentary drop. FPL's biased scheduled net interchange was thus 8 mw.

Q. Now, Mr. Bivans, was it possible for any part of FPL's biased scheduled net interchange of 8 mw to flow through F. P. Corp.'s system and across the state line into Georgia? A. No.

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Q. Is FPL interconnected with the facilities of Georgia Power or any other electric system in another State? A. No, it is not.

Q. Does FPL buy power from or sell power to Georgia Power or any other electric system in another State? A. No, it does not.

Q. Does FPL have any arrangement with F. P. Corp. and Southern Company? A. No, it does not.

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Q. Was FPL invited to participate in the seasonal power interchange between F. P. Corp. and Southern Company? A. No, it was not.

Q. Does FPL derive any benefit from the seasonal interchange between F. P. Corp. and Southern Company?

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A. No, because as I stated previously FPL's own generation is planned to meet its own load without regard to this or any other external source of power, either within or outside the State of Florida.

Q. Why does FPL plan its generation this way? A. About 75% of FPL's load is along the South Florida coast from West Palm Beach to Miami. It is approximately 400 miles from Miami to the Georgia-Florida State line, plus several hundred additional miles further north or west to the nearest major source of low cost fuel for generation. Therefore, due to the distances involved and the transmission lines that would be required, it is neither practical nor economical for FPL to purchase energy generated by others at these remote locations in order to supply FPL's load or any part thereof. Furthermore, due to high frequency of lightning storms and hurricanes in Florida, transmission of large blocks of power over great distances would not be dependable. Mr. Fuqua's testimony covers the history of hurricanes that affected Florida.

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Second, FPL does not depend on any other member of the ISG in order to match its system generation and system load. Neither does the FPL operate in such a manner as to be dependent on the ISG or any out-of-state member thereof. FPL's only contribution to the ISG is to operate in synchronism and assist its neighbors in the event of emergencies. The amount of aid that FPL can contribute by displacement through our neighbors to out-of-state members of the ISG who might be in trouble is negligible. This is true because FPL's response to loss of generation by out-of-state members of ISG is approximately the ratio of FPL's peak load to the total peak load of all members of ISG.

Furthermore this small contribution would be absorbed by neighboring systems in Florida and would never reach the state line some 180 miles away.

For example, as I previously testified, for the loss of the 580 mw of generation by a midwestern utility system as mentioned by Mr. Jacobsen on page 60 of his testimony, FPL's biased scheduled net interchange was 8 mw, which by no stretch of anyone's imagination, could be considered to have crossed the state line let alone travel all the way to the Midwest. Electric companies have operated in synchronism or in parallel for many years. However, it does not follow that all transfers of power and energy between interconnected systems are interstate in nature.

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Q. At pages 46-53, 80, 81 and in Exhibits 18 and 19, Mr. Jacobsen discusses and purports to show that energy from Georgia was transmitted through part of F. P. Corp.'s system and was delivered to FPL at a point between F. P. Corp.'s Turner Plant and FPL's Sanford Plant. Have you studied this testimony and exhibits? A. Yes, I have.

Q. Mr. Bivens, Dr. Jessel has also testified with regard to two tracing methods. Are you familiar with this testimony? A. Yes, I am.

Q. What data did Dr. Jessel describe as the second "essential informational requirement" for his so-called "steady-state method" for tracing power? A. Dr. Jessel, on page 33 and 34 of his testimony describes the second "essential informational requirement" for his "steady-state method" as follows:

> "2. Maps and one-line diagrams of sufficient accuracy must be available from which a single conductor diagram may be prepared showing actual physical positions of each electric line at each generating

station bus, at each substation bus, at each switching

station bus, at each place where branch circuits are connected, and at each point of connection to every investor-owned, municipal and cooperative electric system included in the study."

Q. What data did Dr. Jessel describe as the second "essential informational requirement" for his so-called "commingled method" for tracing power? A. On page 39 of his testimony Dr. Jessel describes the second "essential informational requirement" for his "commingled method" as follows:

"2. Maps and one-line diagrams of sufficient accuracy must be available from which a single conductor diagram may be prepared showing points of connection of single conductor circuit segments at all junction points and at each point of connection to every investor-owned, municipal and cooperative electric system included in the study."

Q. What would a single conductor diagram look like that shows the information which Dr. Jessel said was necessary under both his "steady-state" and "commingled" methods of tracing power? A. I have prepared such a diagram entitled "Single Conductor Diagram"

Mr. Merriman. Mr. Examiner, I ask that this diagram identified by Mr. Bivans be marked for identification as Exhibit No. 45 (B-4).

Q. What is the essential difference between your Exhibit No. 45 (B-4) and Mr. Jacobsen's Exhibit No. 18. A. By comparing these exhibits you will see that Staff Exhibit No. 18 omits the following busses or junction points which Dr. Jessel said were necessary: High Springs, Gainesville, Archer, Silver Springs, Leesburg, Eustis, Deland West, Brooksville and Inglis Power Plant. In addition, my dia-

gram shows the relative physical positions of each electric line at each generating station bus, at each substation bus, at each switching station bus and at each place where branch circuits are connected. This

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information has been described as essential by Dr. Jessel for his so-called "steady-state method." Exhibit No. 18 omits the busses I described above and also fails to show all of the circuits connected to the busses. For the circuits that are shown the relative physical positions of the lines on the busses are not in accordance with fact. Neither does Staff Exhibit 18 show the individual generators and their relative physical location of connection to the busses at Suwannee River and Turner.

Q. Dr. Jessel testified on page 33 that in order to trace kw or kwh flows using his "steady-state method" the first essential informational requirement is:

> "1. Average kilowatt data must be available in tabulated or other form for each hour of each year for each generating unit and for each line segment at each point of connection at each substation and switching station, at each branch location, and at each point of connection with every investor-owner, municipal and cooperative electric system included in the study."

Also, Dr. Jessel testified on pages 38 and 39 that using his "commingled method" the first essential informational requirement is:

> "1. Average kilowatt data must be available in tabulated or other form for each hour of each year for each generation station, for each end of each line segment, at each branch location, and at each point of connection with every investor-owned, municipal and cooperative electric system included in the study."

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Q. Do Mr. Jacobsen's testimony and exhibits show that he has complied with Dr. Jessel's first essential informational requirement, using either tracing method? A. No, they do not.

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Q. On page 46 thru 49, Mr. Jacobsen testified to the data he used and presented Exhibit No. 18, to support his effort to trace interstate power to Sanford. Do you agree with his method? A. No, I do not. In my opinion, Exhibit No. 18 is grossly over-simplified and tabulates incomplete line readings of kw flows at two substations and only two line readings at one generating plant. Exhibit No. 18 does not show kw data (which is required in order to comply with the requirements laid down by Dr. Jessel) for the transmission lines and transformer banks for the following transmission substations and switching stations which lie between Ft. White and Turner:

1. Archer	2—115 kv line terminals 1—115-69 kv autotransformer bank 1—69 kv line terminal
2. Silver Springs	2—115 kv line terminals 5—69 kv lines 1—115-69 kv autotransformer bank
3. Deland West	2—115 kv line terminals 2—69 kv line terminals 1—115-69 kv autotransformer bank
4. High Springs	3—69 kv line terminals
5. Gainesville	5—69 kv line terminals
6. Lake Weir	3—69 kv line terminals
7. Leesburg	4—69 kv line terminals
8. Eustis	3—69 kv line terminals

9. Perry	1—240 kv line terminal 3—69 kv line terminals
10. Brooksville	2—115 kv line terminals 4—69 kv line terminals 1—115-69 kv autotransformer bank

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Mr. Jacobsen also failed to show kw data for the Suwannee Power Plant and the 115 kv lines between Suwannee and Jasper and between Suwanee and Ft. White. He failed to show kw data for the Inglis Power Plant and for the two 115 kv lines to Ft. White; for the four 69 kv lines, one of which goes to Silver Springs; and for the two 115 kv lines south to the Higgins Power Plant. He also failed to show kw data and energy consumption for the many loads served from 63 substations connected to the transmission lines between the Turner Power Plant and the Georgia State Line:

Jennings	Luraville	Webster REA
Alapaha	Luraville REA	Sumterville
Jasper	O'Brien REA	Coleman
White Springs	Trenton	Camps
Live Oak REA	Trenton REA	Dunnellon Town
Ft. White	Old Town REA	Ocala REA
Ft. White REA	Cross City	City of Ocala
High Springs	Otter Creek REA	Silver Springs
Alachua REA	Lebanon	Lake Weir
Alachua	Inglis	Central Tower
General Electric	Red Level	Dallas
Gainesville	Inverness	Leesburg
Rochelle	Inverness REA	Leesburg East
University of Florida	Withlacoochee REA	Tavares

Williston	Inglis REA	Eustis
Proctor	Brooksville	Umatilla

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Reddick	Consolidated Rock	Umatilla REA
Blichton	Croom REA	St. Johns
Perry	Bushnell REA	Barberville
Tri-County REA	Bushnell	Deland
Archer	Archer REA	Turner

Q. Mr. Bivans, in a study to trace the flow of power from Georgia to Turner, why are all of these readings required? A. Without knowing the power flows from all sources and at major switching stations, both as to magnitude and direction it is the rashest kind of an assumption to say that anytime power is flowing into Jasper from Georgia, and power is flowing into the Turner 115 kv bus over the Turner-Silver Springs 115 kv line, that the latter power includes power from Georgia.

Q. From what other source or possible sources could this power originate? A. There are five other sources. One is the Suwannee Power Plant feeding directly into Jasper and Ft. White at 115 kv, or to Ft. White at 69 kv by way of the Perry 240 kv line. A second source is from the Inglis Power Plant, which normally feeds power into Silver Springs via a 69 kv line. A third source is from Brooksville Switching Station, which normally feeds power toward Silver Springs and Deland West over 69 kv lines. The fourth source is from the Orlando ties in the Woodsmere-Orlando area and the fifth is the Turner Plant itself. The combination of these sources can deliver power into the Turner 15 kv bus from Deland West. Therefore, without a complete set of readings as described above it is impossible to determine how far into the F. P. Corp. system any interstate power flows. In

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other words, it is impossible to determine that power from Georgia flows through the large, complex network of 115 and 69 kv lines of F. P. Corp. into its Turner Power Plant.

Q. Is this also true of Mr. Jacobsen's findings and conclusions concerning the Staff Exhibit No. 19? A. Even more so, because by Mr. Jacobsen's own testimony on page 52, the line flow data contained in Exhibit 19 is even less complete than the inadequate data in Exhibit 18.

Q. Would you take the Single Conductor Diagram, Exhibit No. 45 (B-4) and describe to the best of your knowledge the availability of readings on F. P. Corp.'s system. A. *Suwannee River and Inglis Power Plants*—These stations are manned 24 hours each day and line flows and generator loadings are recorded each hour.

Silver Springs, Leesburg, and Brooksville Switch Stations—These stations are manned, generally, from 9 AM to 5 PM daily. Line flows are recorded hourly during the hours the stations are manned.

High Springs, Trenton, Eustis, Deland West, Archer, Perry and Gainesville Switching Stations—These stations are unattended and, consequently, no usable data are available.

Woodsmere and Ft. White Switching Stations—These stations are manned, generaly, from 7 AM to 9 PM daily. Line flows are recorded hourly during the hours the stations are manned.

Jasper Switching Station—This station is manned, generally, from 7 AM to about 9 PM each day. Hourly readings are taken on each line during

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the hours that the station is manned. Line flows are recorded by charts for 24 hours on interstate tie lines.

Distribution Substations—36 of the 63 substations have recording kw demand meters and kwh meters. The remaining substations have maximum indicating kw demand meters and kwh meters, read generally once a month.

Q. In view of the foregoing, in your opinion, are adequate readings available on the F. P. Corp. system to make a valid tracing study of power from Georgia through the F. P. Corp. system to FPL? A. No, there are not. To make such a study it would be necessary to read meters at certain key points on the F. P. Corp. system where readings are not now taken in the normal course of business.

Q. What are the significant differences, if any, between the "basic assumptions" stated by Dr. Jessel for his two tracing methods? A. One of the significant differences is that in his "steady-state method" Dr. Jessel assumes that a bus has electrical dimensions whereas in his "commingled method" he assumes a bus to be a point. A second difference is that in his "steady-state method" Dr. Jessel assumes that all kilowatt data are for unity power factor loads and sources of power supply, whereas in his "commingled method" he assumes that all loads and power supply sources do not have the same power factor.

Q. What are the significant differences, if any, between the "essential informational requirements" stated by Dr. Jessel for his two methods? A. Insofar as kilowatt data and power factors are concerned there are none. In his "steady-state method" generation data are required for each unit within a generating station; whereas in his "commingled method" only the

total generation of all units within a generating station is required. Further, in his "steady-state method" data are necessary to show the actual physical positions of each electric line at each bus and each point of connection. The

actual physical positions of lines are not used in his "commingled method".

Q. Mr. Bivans, you noted that in his "steady-state method" Dr. Jessel assumes that all loads and sources are at unity power factor. Do you know any reason for such an assumption? A. No, I know of no engineering or scientific reason why such an assumption should be made.

Q. Did Dr. Jessel anywhere in his testimony say, with regard to his two methods, that it was necesary or required to obtain, record or plot the power factor of the various loads or sources? A. No, he did not.

Q. Are you familiar with Dr. Jessel's Exhibit No. 34 (J-1) and his discussion with regard to that exhibit? A. Yes, I am.

Q. Please comment on this testimony and exhibit. A. Dr. Jessel uses Exhibit No. 34 (J-1) and his discussion thereof as the basis for his view that his "commingled method" more nearly represents an actual three phase electric power system.

Q. Is it possible to retain the identity of the actual physical arrangements of a bus using other than unity power factors for loads and generation and plot power flows that will provide a more accurate representation of the performance of an electric power system, and fully describe all

of the actual electrical characteristics of all of the power sources and loads as they exist? A. Yes, as is commonly done in power system studies.

Q. Please describe the system studies method. A. Electric companies are continually making system power flow studies. These are a very necessary part of any system planning. The technique for making a power flow study is somewhat similar to the tracing methods described by Dr. Jessel. However, rather than make the study by re-

cording actual kw or kwh on the many line terminals of every generating station and every substation, the system in its entirety, including all lines, loads, generators, and substations, is set up on either an analog or digital computer. From the system as set up on the computer, it is possible to obtain power flows, both real and reactive, voltages, current flows, and other data on every line, load, junction point, and every bus of every generating plant, substation and switching station. This same procedure, without the use of a computer, is valid for making a tracing study of kw or kwh flows, plotting actual recorded data, regardless of power factor of loads and generation.

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Q. Which of the three methods, the two described by Dr. Jessel and the one described by you, has the greatest acceptance and usage within the utility industry? A. The method I describe has universal acceptance in the industry.

Q. Why is this? A. Because this system most accurately describes an electric power system both in its electrical and physical characteristics. It permits retaining the identity and physical arrangement of all busses of substations, switching stations and power plant switchyards. It permits determination of the

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magnitude and direction of power flow in the various bus sections. This is an important consideration in the design of substation bus for proper selection of current carrying capacity and adequate strength under short circuit conditions.

Q. What are some of the companies that have used the "system studies method"? A. I have a list of companies which have used Westinghouse Electric Corporation's computing facilities for making this type of study and a letter from General Electric Company which indicates the extent

of usage of their computing facilities for system study load flows.

Mr. Merriman. Mr. Examiner, I ask that there be marked for identification as Exhibit Nos. 49 (B-8) and 50 (B-9), respectively, the list with accompanying transmittal letter from Westinghouse and the letter from General Electric.

Q. Are these the documents you mentioned? A. Yes, they are.

Q. What is wrong with considering a substation bus or generating station bus as a point? A. Primarily because it is contrary to fact. It is an over-simplification of the system and does not permit determination of power flows which actually exist on busses of generating stations and subtations. This is obviously what Dr. Jessel and Mr. Jacobsen failed to consider. A bus, whether it is in a substation, generating station or switching station is not an electrical or a physical point but rather has dimensions. A bus with its set of three conductors, supported by insulators, is, in fact, a short transmission line to which transmission lines, generators

and transformers are connected at regular intervals, measurable in feet, along its length. Furthermore, a bus has the same electrical properties, that is, resistance, inductive reactance and capacitive reactance, just as a transmission line.

Q. How can power flow in the various bus sections be determined? A. The power flow in any bus section can be measured using the same type of metering equipment that is used for transmission lines. Or the bus section flows can be determined by using the flows as metered on the various lines, generators, and transformer banks and calculating the magnitude and direction of power flow in each bus section, using the "Law of Conservation of Energy" and "Kirchoff's Law".

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Q. What is the "Law of Conservation of Energy"? A. Energy can neither be created or destroyed. In other words, the amount of energy entering a junction such as a connection point between a transmission line and a bus, must be equal to the energy leaving the point.

Q. What is "Kirchoff's Law"? A. Kirchoff's Law states, in effect, that the sum of the currents entering a junction point, such as between a transmission line and a bus, must equal the sum of the currents leaving.

Q. Referring to Staff Exhibit Nos. 18 and 19, were there any scheduled purchases by FPL from F. P. Corp. during any of the hours tabulated therein? A. No, the energy received by FPL from F. P. Corp at the Sanford interconnection was energy that normally circulates among F. P. Corp., FPL, TEC and Orlando in the central and southern parts of the State.

Q. Have you made a detailed study of all of the hours tabulated in the Staff

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Exhibit No. 18 and the corresponding hours in the Staff Exhibit No. 36 (C-2)? A. Yes. I have taken F. P. Corp.'s System One-Line Switching Diagram No. 6840-D-7120-2 and indicated the direction and source of power flowing in and out of the 120 kv Turner Plant bus for each of the hours tabulated in Staff Exhibit No. 18.

Mr. Merriman. Mr. Examiner, I ask that the diagram as identified by Mr. Bivans be marked for identification as Exhibit No. 47 (B-6).

Q. Please explain this diagram. A. You will note that all of the power as generated by Turner generators 2, 3 and 4 and its direction are identified by orange arrows. All of the "unidentified" power flowing into the Turner 120 kv bus from Deland West is shown by a blue arrow. You will also note that a brown arrow is used to identify Turner generation and "unidentified" power coming from Deland West.

Q. Please explain the significance of the orange arrow on the 120 kv line from Turner to Sanford. A. The orange arrow adjacent to the 120 kv line from Turner to Sanford identifies power that flowed from F. P. Corp. to FPL, which was generated in its entirety by F. P. Corp.'s Turner generator No. 4. It could not include any of the power coming into Turner from Deland West.

Q. How do you arrive at this conclusion? A. You will note that Turner generator No. 4 feeds into the 120 kv bus at Point A. Generator No. 3 feds into the 120 kv bus at Point C. Generator No. 2 feeds into the 69 kv bus and through the 120/69 kv autotransformer

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into the 120 kv bus at Point B. By comparing the hourly indicated kw readings for F. P. Corp. Turner generation feeding into the 120 kv bus at Point A, and the corresponding kw indicated hourly readings for the 120 kv line to FPL at Sanford leaving the 120 kv bus at Point A, it is evident that the kw power flow in the 120 kv bus is from A toward B for each of the hours as tabulated in Staff Exhibit No. 18.

Q. Why do you show the power flowing into the Turner 120 kv bus over the Silver Springs line from Deland West as "unidentified power"? A. This is because there is insufficient data available to establish the identity of the source for the power flow into Turner over this line other than from Deland West. You will note on my Exhibit No. 45 (B-4) that there is a 120/69 kv autotransformer at Deland West connecting the 120 kv and the 69 kv busses. Also, there are two 69 kv lines connected to the 69 kv bus.

Similarly, at Silver Springs the 120 kv and 69 kv busses are connected together thru an autotransformer, as shown in Exhibit No. 45 (B-4). Also connected to the Silver Springs 69 kv bus are five 69 kv lines, one of which goes to F. P. Corp.'s Inglis Power Plant and one to Leesburg. Therefore, without additional data concerning the magni-

tude and direction of flows in and out of both the Silver Springs and the Deland West Substations, it is not possible to determine the origin of the flows into Turner Plant from the Silver Springs 120 kv line via Deland West.

Q. Mr. Bivans, have you analyzed the energy flow during 1964 to and from F. P. Corp.'s Turner Plant and FPL's Sanford Plant? A. I have.

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Q. What analysis did you prepare? A. I have prepared a tabulation, based on certain assumptions which I do not concede to be true, but only to illustrate a point, which compares total energy by months received at FPL's Sanford Plant from F. P. Corp.'s Turner Plant with the calculated content of highly questionable content of "interstate energy".

Q. What assumptions have you made? A. The assumptions are as follows:

1. That energy (mwh) for each month was simultaneously flowing on the following lines, power plants and substations in the direction indicated:

a. Energy on the 120 kv lines into Jasper 120 kv bus from Pine Grove, Kettle Creek, and Suwannee Plant.

b. Energy on the 120 kv lines from Suwannee Power Plant toward Pine Grove, Jasper and Ft. White.

c. Energy leaving Ft. White on 120 kv. Silver Springs line.

d. Energy received at Turner from Deland West.

e. Energy received at Sanford from F. P. Corp.'s Turner Plant.

2. That there is no other energy from other F. P. Corp. sources feeding into Ft. White, Archer, Silver Springs, and Deland West.

Q. Why did you make these assumptions? A. These assumptions, while obviously not true, were used so as to

provide the maximum possible theoretical delivery of interstate energy and its relation to the total energy received at Sanford from F. P. Corp.'s Turner Plant.

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Q. How does the amount of energy flowing into the Turner bus from Deland West compare with that flowing from Turner to Deland West during 1964? A. There was 26 times as much energy flowing away from Turner toward Deland West than into Turner from Deland West.

Q. How does the amount of energy flowing from Turner to Sanford compare with that flowing into Turner from FPL in 1964? A. There was 4½ times as much from FPL into Turner than the reverse.

Q. Now, Mr. Bivans, what does your analysis show? A. It shows, on the assumptions I mentioned before, that there was 22,832 mwh flow into FPL from Turner during 1964, and 4,068 mwh flow into Turner from Deland West. It also shows, of the total of 22,832 mwh flowing into Sanford, that only about 16.5 mwh was the most that could have been from Georgia or 0.07%, or one mwh out of every 1,390 mwh. I wish to repeat, however, that I do not concede that such power is interstate, but is only the result of a calculation. This calculated 16.5 mwh is 0.00015% of FPL's Total Energy Delivered to Ultimate Consumers (10,734,212 mwh), or 1 mwh out of every 650,000 mwh delivered.

Q. Mr. Bivans, separate and aside from the transactions at the former Live Oak emergency interconnection, during how many hours on how many days in 1964 did FPL schedule the purchase of power and energy from F. P. Corp.? A. FPL scheduled the purchase of power and energy from F. P. Corp. on six days for a total of 22 hours during 1964.

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Surrebuttal Testimony of Ernest L. Bivans

Q. Mr. Bivans, have you read the rebuttal testimony of Mr. Jacobsen? A. Yes, I have.

Q. Please turn to that part of Mr. Jacobsen's testimony starting on page 11, wherein he purports to trace power from FPL to Georgia via the Sanford-Turner tie. Do you agree with Mr. Jacobsen's conclusions? A. No, I do not.

Q. Please explain why you don't agree. A. A detailed examination of all of the data contained in Staff Exhibits 32 and 33 shows beyond question that none of the power coming into F. P. Corp.'s Turner Plant from FPL's Sanford Plant could possibly reach Georgia.

Q. How is this? A. For every hour tabulated in Staff Exhibit 32, there were at least two places in F. P. Corp.'s 120 kv system where there was a reversal in the direction of power flow and, for one of the hours listed, there were three locations that a reversal in the direction of power flow was recorded.

Q. Where were these locations? A. The first location is in the Turner 120 kv bus itself, the second location is in the Fort White 120 kv bus, and the third location is in the Silver Spring-Archer 120 kv line.

Q. Please explain how the power flows are reversed in direction at Turner and Fort White.

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A. I have taken two of F. P. Corp.'s one line switching diagrams—one for Turner Plant and one for the White Springs Substation—and indicated the direction and source of power flowing in, out and within the 120 kv buses. These diagrams cover all hours listed in Staff Exhibit 32.

Mr. Merriman: Mr. Examiner, I ask that there be marked for identification as Exhibit No. 51 (B-10) the two diagrams described by Mr. Bivans.

Q. Please continue with your discussion of these diagrams. A. As you can see from the diagram of the Turner 120 kv bus, it was impossible for any of the incoming power from Sanford to reach the 120 kv line to Deland West and Silver Springs, located at the opposite end of the Turner 120 kv bus. You will note that for every hour listed in Staff Exhibit No. 32, Generator Unit No. 3 generated from 70,000 to 75,000 kw, as indicated by arrow A, while at the same time the power from Turner to Deland West on the 120 kv line never exceeded 49,000 kw, as indicated by arrow B. Therefore, the power flow in the 120 kv bus for every period listed in Staff Exhibit 32 is away from the terminal of the Deland West-Silver Springs line toward the end of the Turner 120 kv bus where the Sanford line is connected, as shown by arrow C. Thus, all of the power flows on the Turner-Deland West 120 kv line were supplied entirely from Turner Generator No. 3.

Analysis of the Fort White Substation Daily Operating Report, as contained in Staff Exhibit 33, shows that at Fort White Substation there is again a reversal in the direction of power flow toward Georgia for each of the hours tabulated in Staff Exhibit 32.

You will note from the flow diagram of the Fort White 120 kv Substation, also covering the hours shown in Staff Exhibit 32, that the

direction of power flow on the bus, as indicated by arrow C, is from the point where the line goes to Jasper, toward the point where the line goes to Archer and Silver Springs. Therefore, none of the energy coming from Archer could have reached the Fort White-Jasper 120 kv lines. The power flow, as indicated by arrow B, to the 120/69 kv autotransformer for each hour exceeds the incoming power, as indicated by arrow A, on the 120 kv line from Archer and Silver Springs. As this line is connected to the Fort

White bus between the autotransformer and the remaining 120 kv lines, all of the incoming power on the Archer-Silver Springs line is delivered to the Fort White 120/69 kv autotransformer. And, as I said above, there is a power flow in the 120 kv bus section away from the Jasper terminals and toward the Archer-Silver Springs terminal. These flows, as shown by the red arrows, clearly establish another reversal in direction of the power flows between Turner and Georgia

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Q. Have you noted any other discrepancies in Staff Exhibits 32? A. Yes.

Q. Please enumerate. A. Page 1 of Staff Exhibit No. 32 is not accurate. Relative locations and connection points of the lines, transformers, and generators are not shown in accordance with facts. Furthermore, the diagram is overly simplified by omitting all of the 69 kv lines and distribution substations.

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Cross Examination of Cleve R. Jacobsen

By Mr. Merriman:

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Q. Let me ask you this, Mr. Jacobsen, to put this in focus: How long does a bus have to be before it stops being a point or being considered as a point by you? A. I think that any substation you have would be considered as reservoir.

Q. How long does a bus have to be before it is no longer a point as far as your consideration? A. Whatever the

length would be inside of a bus in a substation. I am not sure you could tie it down to any definite length.

Q. Is it possible that you could have a substation bus longer than a transmission line? A. Well, it would be a freak condition, I think. Normally you think of a transmission line has having considerable length.

Q. Is there any reason why a transmission line couldn't be shorter than a substation bus? A. Well, a transmission line is—usually the definition is to move power from the source of power to the load. Normally, you think of it as being several miles from

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a source to the load.

Q. Is it possible that you could have a transmission line that would be shorter than a substation bus, Mr. Jacobsen, although I will concede that generally speaking transmission lines are longer than buses? A. Physically you might have a situation that would be in that category.

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Mr. Merriman: I would like to have marked for dientification as Exhibit No. 56 the document I just described.

(The document referred to above was marked for identification as Exhibit No. 56.)

By Mr. Merriman:

Q. I wonder, looking at this diagram, which is also of the Turner Plant Substation, if you would indicate in red the points A, B and C which are comparable to A, B and C on Exhibit No. 47 for identification.

The first line indicates 110 kv Sanford, and you have indicated that in red as Point A. The line at Point B on Exhibit 47 is the one coming from Longwood?

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Q. Mr. Jacobsen, I would like to ask you this: Can you tell us, please, what your estimate is of the distance between Point A, the line coming in from Sanford, and Point C, the line coming in from Silver Springs? A. About two hundred feet.

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Presiding Examiner: Before you do, Mr. Witness, is there any loss in power of any measurable amount, reasonably measurable, with normal instruments in a bus?

The Witness: It is very small, sir.

Presiding Examiner: When you say "very small," do you mean so small that the ordinary instrument couldn't catch it?

The Witness: I don't believe it would unless it were very, very sensitive. The normal instruments that you would use, it would not. I might add buses are usually built of of such size, not necessarily because of their electrical requirements, mechanical requirements in the substation, that you necessarily have a conductor with a very low resistance. You do not want to have to replace the bus in a substation because it is a key spot in your system. That is why you usually build your buses of great size. Too, when you build a substation you want it to be good for thirty years hence. You don't know how many circuits you are going to add onto the substation; so, you want to make sure you have adequate size in your bus. So generally they are quite large, many times more sometimes than the electrical requirements because of the other requirements. The resistance is quite low.

Presiding Examiner: Thank you.

By Mr. Merriman:

Q. One other question, Mr. Jacobsen, isn't it the

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purpose of a bus bar to carry power from where one line comes on and joins with a bus down, for example, to where another line takes off from the bus? In other words, you indicate about low resistance and so forth?

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Let me ask you this: Do you know if this commingling, the fact of commingling, as you call it, has ever been verified experimentally? A. No.

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The Witness: A bus is used for tying together the different circuits that come in. It is also used to permit you to take switches out of operation so that they can be tested. You have relay testing, the breakers are taken out, or if you want to examine the breaker characteristics. But it is true that a bus is used to tie the different circuits together. It is a reservoir of getting the power distributed.

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Presiding Examiner: It is Mr. Bivan's exhibit, Mr. Witness, but could you give me the meaning of "single conductor diagram"?

The Witness: Yes, sir. Normally in an AC transmission system, you have three phases, three conductors. For simplification and for ease in reading the diagram, they represent the three phases of three conductors by one single conductor,

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by one line on the diagram. In most instances where you see one line drawn on the map, if you went out into the field and looked up on the transmission tower, you would see three phases of the line, or three conductors.

Presiding Examiner: Would you explain further the use of the words "three phases"?

The Witness: It is a vernacular that is used by the system, to use a phase for a single conductor, how much depth—shall I go on describing it?

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Presiding Examiner: Just briefly describe the term "three phase" as it is used in this proceeding, if you will, sir.

The witness: Actually, what I think you are trying to arrive at, it is three conductors. The residential systems, perhaps your house has what they call a single phase connection, they don't bring in all three phases, but they do bring a two-wire system, one phase, whereas on a transmission system you have the three-phase or three conductor system. Large motors are three-phase motors; it takes all three conductors.

Presiding Examiner: What is the meaning of the word "phase" in this sense?

The Witness: Well, there is a phase displacement between the voltage of the transmission line, and they are 120 degrees apart. The voltage, if you were to draw the

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sign wave of the voltage, the waves would be 120 degrees apart, and you refer to this as a phase, or the phase angle between voltages.

Presiding Examiner: Where do the phases first begin; at the generator?

The Witness: Yes, sir.

Presiding Examiner: It comes off in three phases?

The Witness: That is right. They are usually designated A, B, C; X, Y, Z; or 1, 2, 3, depending on the individual system, and they are carried throughout the entire system with that designation. It is very important when you connect a transformer bank at a substation to know what the phase relationship is, so that it can be properly connected with a leading or lagging.

Presiding Examiner: This also refers to the three wires that would come out of the generator, that is the physical aspect of the three phases?

The Witness: Three conductors, yes, sir. Wires are single conductors, and a cable is made of several wires.

Presiding Examiner: Three cables, then, that come out of the generator?

The Witness: Yes.

Presiding Examiner: Do three cables come out of a generator?

The Witness: Three conductors.

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Presiding Examiner: Three conductors?

The Witness: Yes. Three conductors come out to the station—substation. They are usually at the lower voltage, the generator voltage, which is about 20 kv. They usually are not a cable or a bus bar, but they usually have a larger current carrying capacity because of lower voltage, and they are frequently shaped like a rectangle, if you think of a rectangle split, and then they are isolated, given a greater amount of protection, because of the high current that comes from the generator to the first steam plant bus which is right adjacent to the plant. Usually, the transmission substation at the plant is a little further away from the steam plant.

Presiding Examiner: Now, a moment ago you referred to certain residential situations where there would be—what—two phase?

The Witness: Single phase, in most cases.

Presiding Examiner: Single phase?

The Witness: Yes, sir.

Presiding Examiner: That involves just two cables?

The Witness: You just have one phase, but you also have a ground return.

Presiding Examiner: Three phases then refer to three streams of waves that are coming out of a generator, carried through three separate conductors?

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The Witness: Yes, sir.

Presiding Examiner: Thank you.

Mr. Spiegel: Could I ask a clarifying question on this same sheet?

Presiding Examiner: If counsel doesn't object.

Mr. Merriman: No.

Mr. Spiegel: Can I take it here where it shows one line it means it is just one circuit, one three-conductor circuit, and that you won't have a situation where there might actually be two parallel circuits going down a transmission right-of-way, in other words, with six conductors, which would be depicted here as one line?

The Witness: No, you are correct.

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Mr. Merriman: I tender Mr. Fuqua for cross examination, Your Honor.

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Cross Examniation of Ben H. Fuqua

By Mr. Martin:

Q. Mr. Fuqua, would you please turn to your testimony beginning on page 15, where you discuss estimates of the costs that Florida Power and Light Company will probably incur as a result of becoming a public utility?

In that connection, sir, does Florida Power and Light Company keep its books in accordance with the requirements of the Florida Public Service Commission? A. Yes, sir.

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Q. At the time that you gave this testimony, sir, did you know that the Florida Commission prescribes the NARUC system of accounts? A. Yes, sir.

Q. Mr. Fuqua, do you now know how the NARUC system of accounts and this Commission's Uniform System of

Accounts differ, generally speaking? A. No, sir, I can't say that I am too familiar with that. It is my general understanding they are quite similar, the requirements, but there are some differences, I believe.

Q. Would you say that it is probably a correct statement to say that the NARUC and this Commission's acocunting differ basically only in treatment of deferred taxes? A. I am not sure that that is the case. I know that that is one instance where they do differ, but I think that is according to your order.

Q. Mr. Fuqua, could you tell us whether the numbering of the accounts in the Florida Power and Light Company's system of accounts and the texts of those accounts are the same as the account numbers and text of this Commission's system of accounts? A. No, sir, I can't answer that. I should think the manuals will speak for themselves.

Q. Could you tell us whether or not the report which

you filed with the Florida Public Service Commission is the same as the Form 1 Annual Report filed with this Commission? A. The Florida Public Service Commission, yes. Yes, sir, we file a copy of FPC Form 1 with the state commission.

Q. Mr. Fuqua, how long has the Florida Public Service Commission had jurisdiction over the accounting of electric and gas utilities in Florida which would, of course, include Florida Power and Light Company? A. Since some time in 1951.

Q. Mr. Fuqua, did Florida Power and Light Company file any inventory of plant when the Florida Public Service Commission issue its system of accounts? A. I don't know that we filed any inventory, as such. The Commission, of course, had access to all our books and records throughout the time that we have been under their jurisdiction, and members of the staff are in and out of our offices at all

times, but I don't know that we filed any inventory.

Presiding Examiner: By "inventory," do you mean a list of assets?

The Witness: Do you mean a list of assets?

Mr. Martin: Yes.

The Witness: I though you were talking about an inventory of physical property.

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Mr. Martin: Yes, that is what I mean.

The Witness: Of course, we filed an inventory of our assets, a balance sheet and all these various financial records and documents.

Presiding Examiner: What was it that you didn't file or that you are not sure that you filed?

The Witness: An inventory of physical assets—poles, wire, nuts, bolts, insulators.

Presiding Examiner: That you didn't file?

Mr. Martin: He doesn't know.

The Witness: No, sir, I don't think so.

Presiding Examiner: What was it that you did file on this question of assets?

The Witness: Well, all the financial records of the——

Presiding Examiner: You mean just the total balance sheets?

The Witness: The sum total of everything we had is in their possession.

By Mr. Martin:

Q. Mr. Fuqua, did the Florida Commission issue any order or otherwise require an inventory and classification of physical plant similar in any way to this Commission's Instruction No. 2-D which was included in the order issuing its uniform system of accounts back in 1937?

I will read the Instruction 2-D, if I may.

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Instruction 2-D reads as follows:

"Not later than two years after the effective date of this system of accounts, each utility shall have completed the studies necessary for classifying its electric plant as of the effective date of this system of accounts in accordance with the accounts prescribed herein, and it shall submit to the Commission the entries it proposes to make to carry out the provisions of this instruction. It shall submit also a comparative balance sheet showing the accounts and payments appearing in its books as of the effective date of this system of accounts and the accounts and respective numbers as of the same date after the proposed entries shall have been made."

Did the—go ahead, Mr. Fuqua.

A. I am a little confused. You asked me a question, and then you read me a great long quotation from the manual there, and I am not sure what you asked.

Presiding Examiner: A common device of lawyers used at the Federal Power Commission to get certain things into the record. It has nothing to do with the questions they ask.

Now, put a question to him.

By Mr. Martin:

Q. I assure you the intent was not to confuse you in any way. Actually, I was merely pointing out that this

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Commission required a filing of inventory of physical plant two years after it issued its uniform system of accounts, and I was wondering whether the Florida Commission had made any similar requirement, to your knowledge.

A. When you refer to "this Commission," you mean the Federal Power Commission?

Q. Yes, I mean the Federal Power Commission. A. No, not to my knowledge. I have no knowledge of that.

Q. Mr. Fuqua, has the Florida Commission ever made any original cost studies of Florida Power and Light Company properties? A. As to the extent of their examination on that, I can't say with certainty either, although they have examined our books, as I said—well, it has been a continuous process since we went under jurisdiction way back 15 years ago.

Q. Mr. Fuqua, has the Florida Public Service Commission ever issued any order accepting the plant costs filed by your company? A. I presume they have issued orders accepting plant costs because there have been several rate reductions in which, of course, a rate base was established and obviously part of that is a plant—all of it, really, is your plant account, so I suppose those orders that do set those figures

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would be orders——

Q. Mr. Fuqua, has the Florida Commission, aside from any rate orders that have been issued by that Commission, ever issued any orders to your knowledge under its accounting procedures approving any plant costs filed by your company with that commission? A. I have no knowledge of such.

Q. Does the Florida Power and Light Company keep its plant accounts on an original cost basis? A. Yes.

Q. And do they keep continuing property records also, Mr. Fuqua? A. Well, it depends on how you define "continuing property records," I suppose. I don't think the words "continuing property records" appear anywhere in this pamphlet you have got there. We do have, we think, adequate records, and that they have been sufficient for all purposes of accounting, and that the records we do keep are equally as good as you will find, generally speak-

ing, throughout the country, required by any state commission.

Q. To your knowledge, again Mr. Fuqua, has Florida Power and Light Company ever contacted any of the Federal Power Commission's accounting staff to ascertain an estimate of the costs it will incur to comply with the Federal Power Commission's uniform system of accounts?

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A. Not to my knowledge.

Q. Along that same line, Mr. Fuqua, has Florida Power and Light Company ever contacted any member of this Commission's accounting staff to ascertain precisely what this Commission's requirements are with respect to electric plant accounting? A. No, sir. I can't say that we have. I don't believe that any minimum criteria actually is prescribed by your own system. That is the point at issue here, is what it could amount to in the opinion of one individual, myself.

We have not interviewed the accounting staff relative to that matter.

Q. If that is the case, Mr. Fuqua, could you tell us how on page 16 of your testimony you have arrived at the conclusion that compliance with the Federal Power Commission accounting requirements would amount to as much as $4 million to $6 million? A. Well, I say that we have concluded that it could, it could, and I offer an exhibit, which has now been marked Exhibit No. 40, in which I undertake to make some comparisons. Of course, the main one, or I suppose the most prominent is Company-C, which is Florida Power Corporation, and upon which there is some testimony previously. So, if you related what it cost them at that time with that plant account, gross plant of $40 million, if you relate that

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cost to our about $840 million as of June, it gives you, I believe Mr. Jacobsen used the words an "in the ball park" figure. So, that is what I did, and that is why I made the testimony.

Q. Turning to your Exhibit No. 40, Mr. Fuqua, and discussing Company-C, which you say is Florida Power Corporation, could you tell us what the comparable figure to a plant account of $40 million in '39 would be for Florida Power and Light Company? A. What our plant figure was as of that date?

Q. Yes, sir. A. I have it here. I actually have the figure of gross plant, it so happens, for December 31, 1941. That is the closest I have with me. Would that suffice?

Q. Yes, sir. A. It is $89,353,000 at December 31, 1941, gross plant.

Q. Mr. Fuqua, would you be able to tell us over a period of how many years Florida Power and Light Company kept its plant accounts on original cost basis, prior to the assumption of jurisdiction over accounts in 1951 by the Florida Public Service Commission? A. Well, that goes back into history, and it perhaps goes back further than my actual employment. However, as of January 1, 1942 there was a complete reclassification required by the Securities and Exchange Commission. That

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took a long time. A complete job was done. That was, of course, leading up to our divorcement from the holding company, and all the water, if there was water, was squeezed out, and it was original cost. That has essentially been accepted on that basis since that date.

Presiding Examiner: That system conforms to the SEC requirements?

The Witness: Yes. That is what happened, it was pursuant to their requirements that that was done.

Presiding Examiner: Are there any continuing requirements from the SEC? Do you still——

The Witness: We still are required to make certain reports to them. Most of them, though, I think are in connection with the issuance of securities which, of course, we have been issuing every year without interruption for a great many years.

By Mr. Martin:

Q. Mr. Fuqua, how do you know that these reclassification studies and accounting studies which you filed with the SEC in 1942 and the years thereafter which were accepted by the SEC would not also be accepted by the Federal Power Commission? A. How do I know that they would not?

Q. Yes, sir. A. Well, I have no way of knowing, surely, that they

would not, and I have made no statement to that effect. All I have said is from evidence that has come to my hands, and from my estimate of the situation as to what your objectives may be or what you could do or could require us to do, that it could reach a certain figure. That is all I said.

Q. Then, this figure which you have given us of $4 million to $6 million is a figure that is possible but is not necessarily the correct figure; is that correct? A. I said that it was an estimate and that it could be. Based on our estimate, it would be, and on the information that we gathered, we made that conclusion.

Q. Is it not possible, then, after a discussion with our accounting staff, that the figure which you gave may not be adjusted substantially downward? A. It is possible that it could be adjusted downward or upward, I presume.

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Presiding Examiner: A problem that I wanted you to address yourself to was not the difference between the "could" and "might," but when you said this was a conclusion, you meant your conclusion was that it could or it might amount to this much?

The Witness: Yes, sir.

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By Mr. Spiegel:

Q. On Page 3, on the third line, you refer to the possiblity of "duplicate regulation" presumably between the Federal Power Commission and the Florida Public Service Commission.

My question to you is whether you understand that the Florida Public Service Commission has jurisdiction over Florida Power and Light's sales to cooperatives and municipalities for resale? A. Do I know whether or not they do have such jurisdiction, is that the question?

Q. Yes. A. No, they do not. It is specifically excluded in

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the Act itself.

Presiding Examiner: Is that because they are cooperatives?

The Witness: The Florida statute passed in 1951 by the legislature which gave to what was then known as the Florida Railroad and Public Utilities Commission regulation over electric and gas companies specifically excluded municipalities and REA's, and also wholesale contracts between electric companies and those entities.

By Mr. Spiegel:

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Q. When the company makes these interconnections, does it have some kind of an understanding with the company

with which it is interconnecting as to what they are going to do over that interconnection? A. No, not in a formal sense, I don't believe.

Q. Do they have an understanding in an informal sense? A. Well, obviously you have to have some arrangement for the load dispatchers to call up and interchange power or the interconnection would be worthless. That is what it amounts to, I think, on a practical basis, that the dispatchers can, when these situations arise, necessarily, they can make arrangements to introduce power.

Q. Are you saying when the interconnection is made you have no understanding with the other company of the interconnection that they are going to make available emergency power to you? A. Oh, I suppose we have an understanding, not reduced to writing in any firm or formal terms. There are no firm contracts or arrangements. The only reason for the interconnection, though, would be obviously that you were going to interchange some power at some time or another.

Q. Is there any particular reason that you don't reduce these understandings to writing?

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A. I don't know that there is any particular reason. I guess we never thought it was necessary.

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Q. Mr. Fuqua, I would address your attention to the bottom of page 10, where you state that Florida Power and Light undertakes to stand on its own feet with regard to its energy requirements and reserves. Does Florida Power and Light have any interconnections with its neighbors through which it obtains any energy? A. Yes. We are interconnected with some of our neighbors.

Q. When you have an interconnection with your neighbor, for what purpose do you interconnect?

Presiding Examiner: Just to cut it down——

The Witness: We do it for emergency purposes.

Presiding Examiner: Is there any other reason why you have interconnections, other than emergency purposes?

The Witness: No, sir.

Presiding Examiner: What do you mean by "emergencies"?

The Witness: We had—if we have a breakdown, if we lose a unit, that would be an emergency. It could come about by—sometimes, you know, the incidence of lightning in our peninsula is probably greater than anywhere in the world. That has a tendency to knock out our stuff occasionally. There would be emergencies where we would

interchange our power or we might very occasionally have a cold day, but that is very rare in Florida.

Q. When you make this interconnection, do you have an understanding with your neighbor that he is going to supply you with emergency energy if you have a shutdown? A. You keep hammering away on the word "understanding". As I testified before, the obvious reason for the interconnection is for interchange of power. There would be no other reason for having it. It is not formalized; it isn't in writing; there is nothing firm about it. He is under no obligation to us, nor are we under any obligation to him. If it is available at the time we need it in an emergency situation, when we run up against it, why, then we would call up and make the arrangements to get it. It is just as simple as that.

Q. When you get energy from him, there is no understanding or is there any understanding as to how you are going to pay for it, or return it?

Mr. Poth: Your Honor, the witness has said several times—this colloquy, if I am mistaken on that, Mr. Spiegel, go ahead, but I have heard it several times, just in the last minute.

Presiding Examiner: At an earlier time, am I correct that the witness stated there were no written arrangements?

There was certainly some suggestion I got that there were some oral understandings with regard to payment of power that was used.

The Witness: Well, I said that we had an understanding that it would be paid for in kind; that is, over a period of time our two main interconnections have been with our neighbors, the Tampa Electric Company and Florida Power Corporation.

Of course, also we do have a connection with the City of Jacksonville, and quite recently with Orlando. But over the period of time, whatever power is received or delivered will be paid for in kind, and that over a period of a year, let's say, it has a tendency to net out, so that cash settlements are seldom required.

By Mr. Spiegel:

Q. What arrangements do you have for that net settlement? Do you have arrangements with respect to netting? A. Oh, yes, we net out whatever power is delivered to Tampa, Florida Power, whatever it is, and if there does have to be a settlement, it can be done.

Presiding Examiner: Is it done?

The Witness: Oh, yes.

By Mr. Spiegel:

Q. Would you accept subject to check, for example,

in the year 1964 there was a settlement of $75,277 A. Subject to check, yes, sir.

Presiding Examiner: I don't like questions, subject to check. It attempts to shift the burden of the evidence upon the witness.

By Mr. Spiegel:

Q. Page 424 of Florida Power and Light, Form 1 Report for 1964—— A. Is that FPC No. 1?

Q. Yes.

Would you agree that it shows the amount of settlement for interchange energy was $75,277.08? A. Yes, sir. I agree with that figure here. If you will notice as to kilowatt hours there put in at one place and out in another, that they have a tendency to net out, sir.

Q. Would you agree that the figures shown on page 424 of Florida Power and Light's Form 1 Report for 1964 shows that you received 199,059,000 kwh, that you delivered 189,422,000 kwh, and the net difference is 9,637,000? A. Yes.

Q. It is my understanding that this transaction of this large a scale is done without any written agreement; is that your testimony? A. As far as I know, there is no written agreement.

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Presiding Examiner: This weather situation, the hurricanes, as well as a breakdown of a generator going beyond your own largest generator, let's class those as physical reasons, weather and breakdowns, those two types of things.

Assuming that, those are the only reasons why you undertake to have interconnections?

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The Witness: Well, I don't know that I would undertake to make a categorical statement on that. I think they are the principal reasons that we have had interconnections up to this date. We are interconnected with these other companies. As I pointed out, here, or somewhere or another in my testimony—I don't know if it is in the part that you have stricken or not—that in peninsula Florida—you see, there is nothing but water on three sides, so the power has a tendency there just to flow around in a circle. And that could have advantages.

For example, Cape Kennedy, the missiles, the rockets, you would want to be tied in so there couldn't be any possible interruption of service.

Presiding Examiner: You mean to Cape Kennedy?

The Witness: Yes. But that would only be a situation inside Florida, you see, inside Florida.

Presiding Examiner: Are there any reasons for interconnections with other Florida companies, other than these reasons that I have classified as physical, namely hurricanes and breakdowns?

The Witness: I am not going to try to contend that there are not other reasons, economic or otherwise, but I don't want to be pushed into the corner of saying that we belong to some vast intercontinental power pool and we draw power from all over the country, just by virtue of these

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interconnections that we have by our neighbors in Florida. That is the point that I am trying to establish.

Presiding Examiner: Just to clarify the point, you don't exclude interchange with your Florida neighbors for economic reasons?

The Witness: No, I wouldn't. I think it would be foolish to do so. I am not trying to argue that that isn't a good thing to do, but I do not agree that just simply because

we are tied to them and do interchange power sometimes that we immediately, per se, become a part of a vast network of a pool that covers the entire continent.

Do you see what I mean? That is what I am trying to say.

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Q. Does the Florida Power and Light Company make any sales of firm energy to any municipals in the State of Florida who are in the resale business? A. No, sir, I would say not. I am not sure what your definition of "firm energy" is. You can produce that FPC1 again that you had a while ago and it will show that we sold some power to the City of New Smyrna, but that was done because New Smyrna was smack up against the wall; they didn't have any source of energy. They couldn't get their steam plant in, and we couldn't very well stand by and see the customers of the city suffer. We didn't solicit the business; there was no contract, but we did serve them, because that was the only way they had to get any energy down there.

Q. Are you serving New Smyrna now? A. No, sir. I am advised we have discontinued it. And, they do have a small steam plant now.

Q. Are you selling to any municipality now? A. As far as I know, we are not. We are not. Now, we have had situations of this type where some city might be in dire distress because their units went out: Homestead, Vera Beach it has happened, Lake Worth, Fort Pierce, New Smyrna and so on. We would put in either a mobile substation or a mobile unit to help them out for a period of

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time. We have done that on occasions. But that is something that a neighbor—it is just like loaning a loaf of bread, that is the situation there, and, of course, the reports of those transactions do appear in the FPC-1.

Q. So at the present time you are not providing a firm power supply to any municipality for resale by that municipality within its area; is that correct? A. To the best of my knowledge, that is correct.

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Q. Do you have any rule against providing a firm power supply through an interconnection with a municipality? A. Well, there again, we have told Clewiston in the pleading that we filed in answer to your petition to intervene that that was one of the three ways that this matter could be settled with you; one of them could be a direct sale at wholesale to Clewiston by Florida Power and Light Company. So that certainly means that it has not been foreclosed.

Presiding Examiner: Would you read the question, Mr. Reporter?

(Question was read.)

The Witness: What I have stated was that in our pleading we pointed out the we were negotiating with Clewiston and one of the alternatives could be wholesaling by us to them.

Presiding Examiner: I don't want to have to look at the pleading in that case.

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Mr. Poth: It is in this case, Your Honor.

The Witness: It is in this case.

Presiding Examiner: Could you focus on and answer his question directly, rather than what you have said, in reply to their pleading?

The Witness: If I am forced to that, then, I cannot say—I do not make policy. The Board of Directors of the company would make it, so I could not say that we do or do not.

I would say that we are now negotiating with Clewiston, we have made a proposition to them on this very subject of wholesaling and have asked them to carry it to their City Commission, and that we, in turn, would take the matter to our board of directors and put up the question of retailing or wholesaling for a vote in that city. If we could make the arrangements and the Board would agree to it and to be bound by it, we would let the electorate, the freeholders there decide it.

By Mr. Spiegel:

Q. Do you know whether Florida Power and Light has made what you call a proposal in writing or not? A. It was made—no, I don't know if it has been reduced to writing. I think it would be if Mr. McCarthy wanted it in writing. It was made to him certainly verbally. He understands it. I understand he is exploring those

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possibilities, at least that is my understanding.

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Q. Are you stating now it is your understanding that Florida Power and Light is willing to sell Clewiston under certain conditions? A. No, sir. No, sir. I haven't said that at all.

Presiding Examiner: May I interrupt you, Mr. Witness? Sell and interconnect, are those two terms synonymous?

Mr. Spiegel: No, they are not, Your Honor.

In other words, 202(b), as you recall, provides for interconnection and to sell. 202 has both interconnect and sell in it. You may have a situation where two systems are isolated; then, you would have an order of interconnection

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and then an order of sell. But you may have a situation where——

Presiding Examiner: That is all right. That is enough. I interrupted you, Mr. Witness, and I am sorry.

The Witness: I think I just stated that—he asked me if I were stating that Florida Power and Light would sell to Clewiston and I said no, I am not making that statement because I am not the policy-maker, and I am not authorized to make it. I don't say we will or will not. I think that is a matter for our board.

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Q. Mr. Fuqua, does the Florida Power and Light Company have a policy of selling or a policy of not selling a firm power supply to municipalities who are redistributing and reselling the power within their cities? A. Well, there again it is neither black nor white. As I explained a while ago, we sold to New Smyrna for about three years because we had to. We are now negotiating with Clewiston. I would say the situation is quite fluid and flexible at the present time.

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Presiding Examiner: Mr. Witness—If I may interrupt you, counsel—when you sell to a cooperative, are there any restrictions in those agreements as to whom they may resell to?

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The Witness: No, sir. There might have been some in days gone by, but there is nothing now. That would be that they couldn't sell an industrial customer of a certain size load or something of that kind; nothing like that.

Presiding Examiner: I was thinking about this particular situation.

I take it you do sell to a cooperative that does sell to Clewiston? I take it there is no restriction?

The Witness: Yes. Our counsel objected to trying the complaint thing.

Presiding Examiner: I don't want to try the complaint. Is there anything in your contracts?

The Witness: No, there is nothing in there that would prohibit them from doing it.

Actually, what that REA does, they don't sell to the City of Clewiston. They sell to the sugar company, who in turn sells to Clewiston. The reason for that would be that under the law in our state, at least, I think the population of Clewiston would be larger than would be allowable under the law for an REA cooperative to serve. So they sell to the sugar corporation. Clewiston is a sugar

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town. That is the way it started. So it makes for an extremely complicated and complex matter. I doubt if it obtains anywhere else in the country in exactly this way.

Presiding Examiner: Are there any other instances where you sell to cooperatives who, in turn, sell to municipalities?

The Witness: No, sir.

By Mr. Spiegel:

Q. I wonder if you are correct on that.

The same cooperative, Glades Cooperative, sells to the town of Moore Haven. A. Yes. He said any other cooperative, I thought. He didn't say any other——

Q. All right. Isn't it true that each time in the past Clewiston has asked Florida Power and Light to give them

a direct connection and a direct sale that the answer has been no, if you know? A. As far as I know it has been. We have not sold to them. There, again, it has been complicated extremely by the existence of this REA and by the sugar corporation intervening as an intermediary and so on, and we have not. We have negotiated with them, both with respect to wholesale and retail. We have tried to buy the property—I have been there myself in days gone by, more than once—but nothing ever came of the negotiations either way.

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Q. In other words, Florida Power and Light sought to purchase the distribution system that Clewiston has? A. They were discussing both purchase and of wholesaling, and neither one of them ever came to any fruitful conclusion.

Q. Isn't it true that the Florida Power and Light refused to sell at Wholesale to Clewiston because Clewiston refused your offer to purchase their system? A. I don't think that is true. I don't think that is true at all, for this reason: As has been pointed out already, the cooperative has a contract that extends—they say for two more years. You have got that situation facing you, too. But in spite of all that——

Q. Isn't it true a number of times Florida Power and Light has offered to sell at retail within the City of Clewiston, but has said they would not sell at wholesale?

Mr. Poth: Counsel——

Presiding Examiner: Let him finish the question.

By Mr. Spiegel:

Q. Isn't that true?

Presiding Examiner: Mr. Reporter, please read the question.

(Question was read.)

Presiding Examiner: I take it there is an objection?
Mr. Poth: I object on the grounds it is just arguing

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with this witness. It is not productive of this record.
Presiding Examiner: Overruled.
The Witness: What we said to them recently, to Mr. McCarthy, as an element of this proposal we made, if he would agree to it, at any time now that it was necessary, if he did break his contract or anything happens at all, that we would serve them, yes, sir, pending such a time as this matter could be resolved by this question of election. We told them we would.

By Mr. Spiegel:

A. The question of what election?
Presiding Examiner: Before you go on to that, the other question really isn't answered. His question was, did you refuse to sell them at wholesale while offering to sell at retail, I think. Wasn't that your prior question?
Mr. Spiegel: Yes, sir.
Presiding Examiner: Is that true, or not, Mr. Witness?
The Witness: I would say we did negotiate with them on both scores, and neither one succeeded, neither the wholesale arrangement nor the retail, neither one.

By Mr. Spiegel:

Q. The wholesale arrangement did not succeed because Florida Power and Light would not go through with it, is that correct? A. I am not certain—no sir, I don't know that that

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is correct. I am not certain that the City of Clewiston ever insisted on it as a whole. You have got one man, Dan McCarthy, whose attitude we know, but that is all we know.
Q. I am just trying to get one little thing clear.

Is Florida Power and Light willing to serve Clewiston directly or is it not, today, or this year?

Mr. Poth: This question has been asked about seven different times, and just because Mr. Spiegel didn't like the answer he gets, we can't encumber the record all afternoon.

Mr. Spiegel: I have gotten seven different answers.

Mr. Poth: You are doing pretty well.

Presiding Examiner: The witness may answer.

The Witness: I will say I can't answer the question because I do not make policy for Florida Power and Light.

Mr. Spiegel: In view of that, that is far as I can go with this witness.

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Presiding Examiner: Anything else?

Witness Jacobsen will resume the stand and counsel may continue his cross examination.

Cleve R. Jacobsen

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Presiding Examiner: Mr. Jacobsen, one question.

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You mentioned the other day with respect to commingling that this was the normal way to find out whether power was flowing. You recall that came up also in connection with whether you had discussed certain matters with Dr. Jessel. Can you tell me more about your statement, what is the normal way—what you thought that made you adopt this commingling method as your method of analyzing power flow?

The Witness: I would like to state this, Your Honor. I was talking during that time about commingling of elec-

trons on a bus, as my opinion, it was a fact. I believe that counsel for the Florida Power and Light Company suggested that counsel would have said it is a concept.

I think that what Dr. Jessel said was the commingling method of tracing was a concept, there being a difference between the two. I certainly adhere to Dr. Jessel's commingling method that he has described.

As I have stated, I did not consult with Dr. Jessel, and I have not had occasion, in my short time with the Federal Power Commission, to read many of the transcripts. It was just my approach, and we arrived at the same conclusion.

It seems to be a basic engineering concept to make the analysis as I did.

Presiding Examiner: You also said that this seemed to be not only the basic engineering concept, but that this was—I am not using your words—but this was the way it was

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done in the industry, insofar as you knew. Was I correct in my understanding?

The Witness: Yes, sir.

Presiding Examiner: Can you give me some authority—well, first, specifically, what are you referring to now?

The Witness: I am referring to flows on transmission lines that are determined from the daily operating reports, log sheets, which are rather basic and simple. The main point at question, I believe, is the treatment of a bus as a point or reservoir, or as I describe, like a buggy wheel with the circuits coming into the hub and being tied together. Also, the fact that in the studies that Mr. Bivans, for Florida Power and Light has mentioned for the different systems, the digital computer load flow studies and also the network analyzer which are used quite often, in my opinion they treat the bus as a point; because, as I mentioned in my previous testimony I have examined quite a few of the output data, and never have I found

where they have considered the bus as a transmission line showing flows on the bus.

We were discussing this morning the potential for the bus. On each one of these outgoing transmission lines you have megawatt readings. The megawatt reading is made up of power from voltage and current, which is in amps, and voltage, which is in volts. The voltage is always taken from the bus, a common point.

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You have one set of potential transformers that reads the bus. Each out-going circuit has a current transformer that reads the current. You have the current read on each circuit, but the potentials come from the bus, one central point.

In my experience as a substation designer, I have had considerable experience, and I have never treated the substation as anything other than a point, because there are many, many circuits on some of these substations, and when you start to analyze the power flow, as they have suggested, it changes all during the day.

You have many buses that you can pull the circuits from, one to the other and it changes the entire picture when you change it from one bus to the other.

Also, if you have a transfer bus and you want to take a breaker out of the circuit for relay testing or to check the breaker, then you throw the flow on to another bus; in fact, on the bus it changes the whole picture. It is a very changing situation. I just can't see it as anything other than a reservoir or a point.

Presiding Examiner: If you put voltage meters on all parts of the bus, would they all read the same?

The Witness: It depends on the accuracies. Theoretically, there may be some difference. We saw this morning, perhaps, evidence of different potential on two buses; one was a 115 kv bus and the other was a 69 kv bus, but there are

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losses in the transformer, which is the reason you might have difference in the 69 kv and the 115 kv bus.

Presiding Examiner: Would the 115 kv bus and the 69 KV bus be interconnected?

The Witness: They are interconnected by a transformer, a step-down transformer.

Presiding Examiner: Take the 115 kv bus and just confine my question to that. If you put volt meters—is that the right word?

The Witness: Yes.

Presiding Examiner: —all around the bus, at various points on the bus, would they all read the same?

The Witness: No, sir.

Presiding Examiner: In what way would they differ?

The Witness: Well, there would be a slight change in the voltage.

Presiding Examiner: Is that due to slight resistance within the bus?

The Witness: That is true, yes. It is very slight, and we are talking about minute parts.

Presiding Examiner: I believe you testified that the bus is designed so as to have a minimum amount of resistance, did you not?

The Witness: Yes, sir. It usually ends up that way, sir.

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That is because there are many considerations that you have to use in designing a bus. When you take in the mechanical considerations and all the other considerations, you usually end up with a bus that is much bigger than you probably would need if it was just designed for the current carrying capacity. It is desirable to have a low resistance in the bus.

Presiding Examiner: I take it your testimony is there would be some differences in reading on these various volt meters, but they would be fairly small?

The Witness: Yes, sir.

Presiding Examiner: And this would be due to internal resistance within the bus, itself?

The Witness: That is true.

Presiding Examiner: Would they be quite infinitesimal, these differences?

The Witness: They would be small.

Presiding Examiner: You don't know what infinitesimal means, and I am not sure I do.

How small?

The Witness: I am not sure with the type of instrument you have in a substation control room that you could detect it, because it would be a small amount, and these are not calibrated too small.

The range of reading is such that it would be difficult to read.

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Presiding Examiner: The real purport of what I was trying to get was, is there enough difference so that it affects the problem here in any significant way?

The Witness: I am not sure it would affect the problem, no, sir.

The results on the megawatt reading, there are too many other factors that you can make greater errors with than with the potential reading. I mean, the operator's sight would be one thing. He is back away from the board several feet, and with the glare and looking at it at different angles and taking the readings at different times—so if you were to try to get a simultaneous flow, your answer would be off much more than just strictly the voltage drop of the bus.

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Testimony of Dan McCarthy
Utilities Commissioner
Clewiston, Florida

Q. Please state your name and address. A. Dan McCarthy: I live at 811 West Royal Palm Avenue, Clewiston, Florida.

Q. What is your official position with the City of Clewiston, Florida? A. I am Utilities Commissioner of the City. There are 5 elected Commissioners of which I am one. These Commissioners are the governing body of the City. The Commissioners elect one of them their Mayor-Commissioner. The Commissioners appoint a City Manager.

Q. What are the duties of your office as Utilities Commissioner? A. I am responsible to the City Commissioner for the supervision of the operation of the electric, water and sewage departments.

Q. How long have you been Utilities Commissioner? A. I have been a Commissioner for 14 years, during 11 of which I have been Utilities Commissioner.

Q. How long has the City of Clewiston owned and operated its own electric distribution system? A. Since 1937 when it took over an existing system from a bankrupt local electric company.

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Q. To your knowledge, when did Clewiston first seek to obtain a wholesale supply of electric power from Florida Power & Light, and what was the result of this effort? A. In May 1952, the then Mayor William C. Owen contacted Florida Power & Light in a joint effort between Clewiston and U.S. Sugar to obtain power for the summer months. Florida Power & Light stated its willingness to sell power to U.S. Sugar, but was not willing to permit the power to be resold to Clewiston.

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Q. When was the next effort made to obtain wholesale power from Florida Power & Light? A. In August 1954, I contacted a Mr. R. F. Lewis, a division manager, and he arranged a series of conferences at which were present Mr. Robert H. Fite, new President of Florida Power & Light, and a Mr. Richard Hill Clewiston requested direct service at wholsale. This was refused for the reason that this was contrary to company policy. The policy is that Florida Power & Light would not sell to a municipal at wholesale except in the case of furnishing an emergency supply. As an alternative they proposed to lease Clewiston's distribution system and sell directly at retail within the City. This counter-proposal was rejected by the City Commission.

Q. What did the City do then? A. The City entered into a new contract with U.S. Sugar, which in turn entered into a new contract with Glades which, at approximately this time, began purchasing power from Florida Power & Light.

Q. When did Clewiston again request direct service from Florida Power & Light? A. In 1957 I again requested that Florida Power & Light sell directly to Clewiston. A formal meeting was held between the City Commission and a number of officials of Florida Power & Light, including Mr. Robert H. Fite, their President, and Mr. Ben H. Fuqua,

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now a Vice President. Mr. Fite stated in essence that Clewiston's request was rejected, but that they would be willing to buy out the system and sell at retail within the City. The Commissioners turned down this counter-offer, and as a result were unable to purchase power from Florida Power & Light. At this conference, Mr. Fite reiterated,

in essence, the same company policy as was stated in the 1954 negotiations.

Q. When did you next make an effort to obtain an electric power supply from Florida Power & Light? A. In 1962 I had discussions with Messrs. Richard Hill and F. R. Lewis, again requesting a direct power supply from Florida Power & Light. They stated, in essence, that the Company policy had not changed and that it would not therefore sell to Clewiston at wholesale.

Q. When did you next make an effort to obtain an electric power supply from Florida Power & Light? A. In July 1965 I telephoned Mr. Richard Hill, who is now one of Florida Power & Light's Division Managers, and requested a direct wholesale electric supply from Florida Power & Light at the same rate and charges as Florida Power & Light was using for its sale to Glades. Mr. Hill stated in essence that the company policy had not changed, and that it would not sell to Clewiston.

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Q. Have you had any further conferences with officials of Florida Power & Light? A. Yes. Several conferences have been held since the middle of August, at the initiation of Florida Power & Light. As a result, I have talked with the following officials of the company: President Robert H. Fite, Executive Vice President R. C. Fullerton, Vice President J. G. Spencer, Jr., and Mr. Richard Hill. The last conference was on September 24, 1965, with Mr. Fite in his office, and was attended also by Mr. Spencer. Mr. Fite stated in essence that the company policy regarding selling power to municipalities had not changed, but could change. He would propose to the Board of Directors of Florida Power & Light that if the City of Clewiston would agree to have a referendum to see if the City would sell its distribution system to Florida Power & Light, or should continue to operate it, and the Commission would be bound by this

referendum, Florida Power & Light would sell directly to the City if the referendum vote were in favor of City ownership. I asked Mr. Fite whether the sale would be at the same rate as the sale to Glades. He stated, in essence, that it would not necessarily be that low, and that it would have to be worked out. I told him that if the company gives us a proposal in writing it will be presented to the City Commission for appropriate action. So far we have not received any written proposal.

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Cross Examination

By Mr. Martin:

Q. Mr. McCarthy, could you tell us the name of the

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local utility that the City of Clewiston succeeded in operating this electric distribution system in 1937? A. Actually, I didn't live in Clewiston in 1937, but I remember it was Glades Power Company. That is a simple matter, if it is important, Your Honor, to provide.

Q. Did the City of Clewiston purchase this system at that time? A. They did, sir.

Q. Could tell us whether or not the purchase of all of Clewiston's requirements of electric energy from the United States Sugar Corporation commencing in 1948 rather than in part, using its own generation, resulted in operational economies for Clewiston? Is that the basis of the decision to do that? A. Yes, sir; in 1948.

Q. In regard to the refusals of direct service by Florida Power & Light Company which you discuss on page 3, page 4 and page 5, was that direct service refused only on the basis that their company policy prohibits all except emergency wholesale service to municipalities? A. That is what we were told.

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Q. Mr. McCarthy——

Presiding Examiner: Who told you that?

The Witness: I indicated in several places there. I was told that by Mr. Fite three different times, by Mr.

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by Mr. Spencer, by Mr. Fullerton, by Mr. Hill on at least five or six different occasions. Those were men who I can call by name, sir.

By Mr. Martin:

Q. Mr. McCarthy, assuming Florida Power and Light Company agrees to sell power and energy at wholesale, which, according to your testimony presently they aren't, at what voltage does Clewiston desire this service? A. The City's transformer bank, as they have it now, is a dual transformer that can accept current at 13,200 or at 4,160 volts. I am not an electrical engineer, so I am not sure what is involved. The transformer arrangement is such that it is kept at either one, either voltage.

Q. Where would this interconnection be made? A. The City's present tie, the three-way tie now is at the south edge of the city, at the south city limits. If a tie were permitted, the city had planned to go to Florida Power & Light Company's main transmission line, which is approximately three miles south of the city.

Q. Can you tell us what electrical facilities the City of Clewiston would build to receive this service? A. Mainly a power line, and if necessary, a transformer station or substation, I think they would call it.

Q. Could you give us an estimate of the construction cost of the electrical facilities which the City of Clewiston

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would have to build? A. If they only built a transmission line and tied to the present transformer station of the

Florida Power & Light Company, our engineers have come up with a figure of approximately $40,000. Florida Power & Light Company, when they estimated the cost in 1957—may I refer to my notes?

Presiding Examiner: Yes, you may.

The Witness: Florida Power &Light Company says they could build the line to their substation for $17,500.

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Redirect Examination

By Mr. Spiegel:

Q. In answer to some questions by the staff, you indicated the cost of the transmission line that would be required to be built for Clewiston to obtain direct service. Would there also be involved in connection with that the possible construction of a transformer substation, and, if so, can you tell us what that would cost? A. Our engineering firm has said if we cannot buy power from Florida Power & Light Company at their secondary voltage that we would put a companion transformer station on this same line, and that this total cost would be approximately $500,000, which the city is willing and able to undertake at this time.

Q. Can you tell us what the approximate annual savings will be in purchase power cost if this interconnection is made, Mr. McCarthy? A. In excess of $100,000 a year, sir.

Mr. Spiegel: That is all the questions I have, Your Honor.

Mr. Poth: This has raised just one.

Presiding Examiner: Before you go on, does the $100,000 take into consideration the $500,000 investment?

The Witness: Yes, sir.

Presiding Examiner: Cross examination.

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Recross Examination

By Mr. Poth:

Q. Mr. McCarthy, you said "our engineers advised us." Who are "our engineers"? A. The City of Clewiston employs the firm of Smith and Gillespe as consulting engineers. The figures of cost came from Mr. Fite and your own engineering department in Miami, and he also reaffirmed these costs in our meeting on September 24th.

Q. I was not speaking, Mr. McCarthy, of costs. You had referred to "our engineers." I just wanted the record to be clear as to who "our engineers" were. Messrs. Smith and Gillespe are the people to whom you referred? A. Yes.

Presiding Examiner: Anything further? If not, the witness is excused.

(Witness excused.)

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Cross-examination of Joseph J. A. Jessel

By Mr. Merriman:

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By Mr. Merriman:

Q. Dr. Jessel, to the best of your knowledge, does Florida Power Corporation have any obligation to serve firm power to the southern company systems or Georgia Power? A. The seasonal exchange, as I read the contract, would indicate a firm commitment both ways. In other words, this system depends on the seasonal exchange of this 100 megawatts of capacity. As I would view it, it would be a firm exchange.

Q. I would like to direct your attention to Florida Power Corporation's FPC Form 12 for 1964. It is an item by reference. Do you have it? A. Yes, I have it here.

Q. Schedule 13 which appears at page 22. On Florida Power Corporation's peak day and peak hour, which was January

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14, 1964, 6 to 7 p.m., when Florida Power Corporation was receiving power from Southern Service, what was the situation with regard to transactions with Florida Power & Light? Was it receiving power from Florida Power & Light or was it delivering power? A. It was receiving power from Florida Power and Light, that is, for the particular hour.

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Presiding Examiner: I take it the theories are not necessarily right or wrong. How does your theory better explain the facts?

The Witness: I think that would be a better question.

Presiding Examiner: Yes.

The Witness: I think I can explain that rather simply. The so-called commingled method in my view accounts more easily for what actually takes place on an electric power system. I will explain why I say that. The electric utility system, as we know it today, is a very complicated one. The reason why it is complicated is because many things take place in fact on the system. First, begin with the power generator, namely, the unit which converts the mechanical energy of rotation by driving the shaft in a magnetic field to produce electric energy provided you can get the load on it. If you have no load on the generator, than all you produce is voltage, nothing else. Now, this production of voltage is in the form of sinusoidal wave,

sign wave, in other words. It might help you if I show you a chart.

Presiding Examiner: It will probably be better to mark this for identification.

Counsel, this will be marked for identification as

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Exhibit No. 58.

(The document above referred to was marked Exhibit No. 58 for identification.)

The Witness: Now, the solid black line represents a picture of the instant to instant shape of a voltage wave form. That actually takes place in a coil of wire imbedded in some special silicon steel frame in which you spin this metallic iron structure, which includes some wires wound around it which produces a permanent magnet. In the sense the current goes through this wire, you have a permanent magnet. Driving this permanent magnet around induces in these stationary coils a voltage having a wave form as shown by the black line. In three-phase power you have three sets of these coils which are spaced apart electrically 120 degrees. In other words, going from zero to zero in one complete wave form, you have 360 degrees. If you place these coils on a generators 120 degrees apart, you get three of these wave forms and three sets of coils, which at the time of generation are separate. Each coil has two terminals. You can, if you want to, take each separate set and carry it along and deliver power to a single phase motor, as we call it, or you can tap each one of those on the terminals somewhere and get three-phase power. Fortunately, it was developed that because of the position 120 degrees electrically apart, you don't have to have any return wire at all. So you can just

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take out three wires from the generator rather than six. It doesn't affect it electrically as long as you have each of the three phases balanced.

Now, the wave form of each voltage is as shown there. If you have no current, you have no load. As soon as you put on a load, then you get the wave form shown by the broken line. The current flows in each of these three phases of the generator. If you multiply the voltage by the current, in each instance you get the dotted-dashed line, which is the so-called instantaneous power curve for each phase. This is a physical fact which takes place in each phase, and this is the power that is transmitted by each phase of the three-phase transmission lines. You deliver it to a substation or to another customer or some other point. But this is the mechanism by which you actually get electric power transmitted along a transmission line. Each phase is independent of every other phase in its actions.

Now, if you take and look at these phases, as you would a bundle or an ensemble, you would get a picture that looks something like this.

Presiding Examiner: The prior document marked Exhibit No. 58 is entitled "Curves Showing Instantaneous Voltage, Current and Power for Single-Phase Operation at Lagging Power Factor through Two Singles."

The next document, which will be marked Exhibit 59 for

identification, and that is entitled "Single Phase Power Curves"—does everyone have a copy of this document.

(The document above referred to was marked Exhibit No. 59 for identification.)

Presiding Examiner: I believe the first day of the hearing I informed counsel for both sides I would put this question both to Dr. Jessel and Mr. Bivans and I will welcome Mr. Bivans' answer to a similar question later.

The Witness: Now, Exhibit No. 59, here there is shown the three phases separate from each other as they are physically in nature.

Presiding Examiner: They are physically in nature?

The Witness: In nature. It shows the time displacement, the angle displacement among each one.

For example, the top one, phase A starts at zero degrees, zero magnitude. It becomes negative for a short time. Then it goes above the zero line and becomes positive. You notice going through a full power cycle you have four zero points. In other words, four times during that cycle you transmit no power at all. The same thing is true of phases B and C. This is a characteristic of electric power phenomena.

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Presiding Examiner: When you say angle, what do you mean?

The Witness: The horizontal line across the bottom is shown as zero, 30, 60, 90, 120, 150, 180. That is known as electrical angle.

Presiding Examiner: What is that?

The Witness: That is in degrees, electrical degrees.

Presiding Examiner: What does that measure?

The Witness: That measures two things. One, it can measure time. For example, you have two pole machines, one South and one North. One complete revolution is 360 degrees. So if you have 60 revolutions per second, then you have a time measure too.

So Exhibit 59 shows the instant to instant characteristics of the power transmitted by each of the three wires going out on a three-phase system.

If you look at these three as a unit, as three-phase power, you get another picture.

Presiding Examiner: This document will be marked Exhibit No. 60 for identification, entitled "Curves Showing Instantaneous Power for Three-Phase Operation at Lagging Power Factor through Two Cycles."

(The document referred to was marked as Exhibit No. 60 for identification.)

The Witness: If you look at these three curves, they are

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superimposed in effect—the three shown on Exhibit No. 59. Now if you look at the three—at the ensemble as a package, you will notice that some of the time you have the bottom cusps below zero which shows some one phase is always transmitting power in a direction opposite to the direction of the main power flow above the zero line.

If you look at the top line, you will notice that the power instead of being steady has a small cusp above a straight line which shows the power flowing in the other direction.

Now this is a picture when you consider three phases as an ensemble. It is not a fact as to any one phase, but you have all these three alternating and flowing in one direction. There is no such thing as three-phase power physically. It is a convenient concept or approach to treat the three phases together for metering purposes and analytical purposes. But as physical matter, there is no such thing as three-phase power per se. It is three separate phases which because of the way the business is conducted each phase is metered separately, averaged out and then averaged together to get three-phase power. So it is the mathematical approach.

Presiding Examiner: What is the mathematical approach?

The Witness: The mathematical approach would be the straight line on the top below the cusp.

Presiding Examiner: This line on top is a mathematical averaging of the three phases?

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The Witness: That is right.

By so doing, it mathematically ignores the physical facts that are taking place.

With that as background, getting back to why I think the commingling method more nearly approximates what takes place, of course, as far as I have gone so far I have only

described what takes place in an actual system simplified to the situation where you get no changes during the particular period you are considering. However, unfortunately, as the frequency curves show, that is not the situation.

The electrical system is such that when the loads come on the generators they are not in position because of inertia to respond at exactly the same instant, so there is always a lag between load and generation. Sometimes you have more generation than load and other times less generation than load.

This is indicated by the frequency chart which is in Mr. Jacobsen's exhibits. Those charts, however, are a little bit hard to read unless you realize those charts which show frequency may be sometimes hard to interpret because they read merely short term averages of frequency and not actually each variation of frequency. So when you read those charts you have to recognize what they read.

To illustrate what I am talking about, I will take an instance. We have a sudden addition of a load to a system. When load comes on there is no supply of additional power supply at

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that instant. There is no way of getting it there. So the first effect is a contribution from what is already in the system to that new load. That is the first effect.

Now since there is an imbalance between generation and load, there is more load than generation, there is an increment of load greater than generation. This corresponds to a torque on that machinery; it tends to slow it down. This slowing down acts on the machines differently because each has different inertia characteristics. Because of that you get a swinging between these machines, and the swinging tends to swap loads among themselves in the first instance.

Presiding Examiner: Which are the two generators that have different characteristics of inertia?

The Witness: By inertia, I am referring primarily to their spinning weight. Unless the machines are the same size and the same weight, they have different inertia constants. That means for any given imbalance, as can be shown to be a torque, an unbalanced torque, each machine will deviate from its position in proportion inversely to its own inertia. Small machines will deviate more from their positions than the bigger machines.

Now this activity by deviation has a tendency for the machines to swap loads among themselves initially. That is the first reaction.

The second reaction is when these machines all slow

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down, but not at quite the same rate because of this swapping of loads, this uneven slow-down effect, the rotating machinery has energy of rotation which is proportional to the square of the speeds jjust before and just after this load has been added. So they contribute energy to the system by so doing.

Then a little bit later on you get a frequency change or a variation of such magnitude that a governor somewhere in the system will give the first input to supply the steam into its turbine.

This action is not predictable as to which machine will do it, because each governor has what we call a dead band, a frequency range in which it won't respond to anything.

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The governor which is the nearest to the edge of that range will respond first. It may be ten miles from that load, or a hundred miles from that load, or a thousand—not normally a thousand because that would be quite an angle of shift, but maybe two miles away, ten miles away, but the first response will come from the governor nearest to the

dead band edge. That is the usual sequence you have to picture. That is what actually takes place.

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Cross Examination (Resumed)

The Witness: I belive I was in the process of continuing a description of system operations to reflect why in my view a certain approximation of system operations more nearly corresponds to what actually takes place. I am trying to see where I stopped here, so I can continue.

Presiding Examiner: You are also going to tell why Mr. Bivans' view does not correspond with your view.

The Witness: I shall also attempt to do that, yes.

When these systems operate, as they do, there is a continuous variation in load and a continuous attempt through control means to have the generation match the load. However, due to the inability of the physical equipment to respond fast enough, there is always a deviation or a difference between load and generation, and the short-term after effect is detected by your frequency curve because this deviation appears as a slowing down of the revolutions per second or per minute, or dropping of the frequency or later on increasing the frequency.

For example, should loads suddenly go off, it would then, of course, require an increase in frequency. So that is a known fact. Industry, of course, has means of actually following instance by instance what takes place on each phase of a three-phase system as shown by Exhibit No. 59. This is a simplified sketch of the actual power travelling along a transmission line here.

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Superimposed on this smooth curve is the effect of the instantaneous response of a system that is given at the time the load comes on, and this effect varies according

to what happens on each step on the way, which I described yesterday.

An oscillograph can actually show pictorially the curves of Exhibit 59 or their change, or what we call "distortion," because of the variations in system power flows because of the ever-varying load changes. The electric system cannot operate, or does not attempt to operate with oscillographs. The next best thing is to apply or adopt a system which we normally call frequency bias tie line control system; namely, what they do is this. They meter at all the tie points with all of the systems the actual amounts of power going into and out of the particular system.

This metering, because of the availability primarily, and the cost of the equipment, is a meter which averages the power pulsations shown on Exhibit 59.

In other words, it takes the summation of the area above the zero line and substracts the area below the zero line and gets a net average power, moment by moment, say, covering probably within a range of 1 to 3 seconds, depending on the type of metering unit.

Presiding Examiner: This is actually for all three phases?

The Witness: This is for all three phases and adding them together arithmetically.

This is a means used to monitor what is going on in a system

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at its terminus. For example, take two situations. Assume that a system wishes to have no transactions with any other neighbor. It will set its control equipment on zero interchange. Then all of the readings for all of the tie points will be metered to a common meter, which will add and substract how much is going in or coming out of the system. Then that net amount, if it is zero, will agree with the schedule of zero.

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Then the system knows it is operating on its desired level. It is taking care of its own load and nothing else. Say that particular meter is reading 10 megawatts or 20 megawatts, that shows—suppose it reads 20 megawatts going out. That means that the system is generating 20 megawatts more than it should to meet its own requirement, because there is no schedule with any other system on a net basis.

In other words, all of these are net approaches. Then this 20 megawatts differential will send a signal to your control which will move a glider and it will cause a current to flow to the control system which will send a signal to your generators to reduce production by 20 megawatts, to try to approach zero. In most systems that I am familiar with, it is never quite perfect. There is always a deviation there. If you look at a deviation chart which is drawn in one of these control offices, you will find that the moment-to-moment curve is a zig-zag curve of quite a wide span, because there is always that lag and inability to follow the load by the generation.

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Now, in operating there is also a further problem; namely, there can be and always is, and the system provides for loss of a transmission line or loss of generating units or any sudden disturbance like due to lightning, knocking out the circuit. It usually causes quite a drastic change on the system.

For example, a system in trouble, say a 400 megawatt unit may go out. Then that particular system will have a deficiency between load and generation of 400 megawatts.

The first reaction at the time of that loss is to draw into the system energy to its interconnections. Now, the amount of energy being drawn into the system is in proportion to the capacity within a system and to the capacity of all systems with which it is interconnected. So that

example of losing a unit in Southern Florida and causing a disconnection at Fort White is due to the fact that there, at the time of that outage, I would say roughly 90 or 95 percent of the supply at that instance would have certainly come from out of Florida. That is the reason you have the outage at Fort White.

When a system has an outage, and assuming sufficient line capacity, then there is a bias control, a frequency bias control, where each system agrees to set its control so as that it will contribute a certain amount of its own capacity to whatever area is in trouble. Usually, it is 1 or 1.5 percent of its installed capacity or peak load, depending on the system they desire to follow. This is based on a 1-10 cycle drop or change, increase

or decrease, in frequency

If it is increased, then they back off that amount of generation. If it is decreased, they supply that amount. So whenever a system is in trouble, the attempt to whole tie line control is countermanded by the control system which says, "Supply power to the area in trouble until it is cleared up, and then come back to your tie-line control." That is the principle that is used.

Now, most of the meters which we use today in the industry are of two types. One is an indicating meter which measures the net average of the powers of each of the phases shown in Exhibit 59, and we have an integrating meter which essentially measures these for an hour. And these are the meters which industry needs for business purposes, primarly, because they are in the business to supply service and make some money out of it. That is why they are there. Otherwise they wouldn't be there, in my opinion.

So, any analysis which includes the use of industry type meters does not disclose what actually happens on the

system. It only gives you the averaging effects of a whole lot of variations.

So the question in my mind is, how can you approximate an actual system as closely as possible to account as realistically as possible what actually takes place on a power system?

Let me give you another evample.

Mr. Martin: Mr. Examiner, the staff requests that this

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exhibit entitled "Comparison of 100 Percent and 80 Percent Power Factor Power Characteristics" be identified as Exhibit No. 61 for identification.

Presiding Examiner: This document entitled "Comparison of 100 Percent and 80 Percent Power Factor Power Characteristics" will be marked for identification as Exhibit No. 61.

(The document previously referred to was marked Exhibit No. 61 for identification.)

The Witness: I propose to use Exhibit No. 61 in connection with Exhibit No. 34.

If you look at Exhibit No. 34 you will notice that Generator 2, G-2 and load, L-2, are both on the right-hand side of Exhibit 34. On the basis of this exhibit it would indicate that Generator G-2 would supply all the power requirements of Load L-2. Let's look at what actually happens on say one of the three phases as shown by Exhibit 61, where L-2 is one of the phase loads of the load L-2, and G-2 is one of the phase outputs of G-2.

Now, beginning at zero degrees on Exhibit 61, you will note that the generation between, say, zero degrees and roughly about 35 degrees on this scale is increasing during that part of the cycle. You will notice that the load is supplying power back to the system, as shown by the curve below zero. That means that during that part of the power

cycle the power flow would be from G-2 to C to Captial B, and also would be from L-2 to Capital

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D, Capital C and Capital B.

Presiding Examiner: You are referring to Exhibit 34?

The Witness: That is correct.

Presiding Examiner: Off the record.

(Discussion off the record.)

Presiding Examiner: Back on the record.

During the off-the-record discussion Dr. Jessel explained that on Exhibit 61, 35 degrees would represent a point at about 13 megawatts.

The Witness: On the right scale.

Presiding Examiner: On the scale marked G-2.

The Witness: That is right. You see, there are two scales there. It is on the right scale. The scale on the right.

Presiding Examiner: What do you mean by the scale on the right?

The Witness: This (Indicating.)

Presiding Examiner: Oh, yes. You mean the scale on the left?

The Witness: I mean the right scale on the left side, the right-hand scale on the left side.

Presiding Examiner: Do you mean to apply at the point where the line G-2 intersects——

The Witness: Thirty-five degrees.

Presiding Examiner: Thirty-five degrees?

The Witness: That is right.

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Now, continuing: In the range, say, from 35 degrees, which we just described, to 90 degrees, which is the place where the G-2 curve and the L-2 curve cross, the reading

in there is 40 on that left-hand scale—the right-hand scale on the left side of the sheet.

During that time you will notice that the production for that part of the phase is greater than the load for that phase. So during that interval there is a flow of power on that phase from G-2 on Exhibit 34 to Capital-C, to Capital-D and to L-2, and also from G-2 to Capital-C, to B.

Presiding Examiner: That is because the load is only 20 megawatts?

The Witness: Yes, that is right; at that time.

Of course, at the time where they cross, the only flow is from G-2 to L-2, because they are equal at that point.

Presiding Examiner: In other words, L-2 and G-2 are equal?

The Witness: At 90 degrees.

Presiding Examiner: The consequence of that is what?

The Witness: The consequence is the contribution of power in that phase for the L-2 load comes entirely from G-2 and G-2 supplies no power to any other load.

Presiding Examiner: How do you know at the prior time that the power from G-2 didn't go beyond B, as far as A?

The Witness: It would go anywhere. I was just trying to show the direction from the point C. It would go to L-1—

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of course, that is the other load. I am trying to analyze the kep points of Capital D, Capital C and Capital B, primarily, Your Honor.

In going from the 90 degree point on the curve to the 180 degree point on the curve, where the curves cross again on the zero line, you will note that except where the curves cross at the top and the bottom crossing, the load curve, or the load, as shown by the curve toward that phase is greater than the generation by that phase. That means then that there is a contribution of power from G-1 to supply that load, because G-2 output is not sufficient. This

cycle just continues on and on. This takes place on each phase separately.

Presiding Examiner: Instead of the connection coming from G-1, could it not come from a second phase of G-2?

The Witness: No, because the phases are all separate.

Presiding Examiner: Separated by time?

The Witness: By time they are separated electrically, too; they are insulated from each other. You can test this, I have seen this done in a laboratory in my younger days, where you can take a generator and disconnect the three-phase windings and put in special conductors and send each phase separately to a load, and connect each phase separately to the motor end. This power flow actually takes place separately for each one.

Presiding Examiner: The motor will start working?

The Witness: The motor will receive power from each

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phase separately.

Presiding Examiner: What would keep the motor going, inertia?

The Witness: What happens is this, when you space these power windings apart, the contribution to the motor by each phase because of the position of these various windings—it looks something like Exhibit 60, where the power pulsations of each phase are shown in sequence, those portions, which are below the zero line, are usually so small—I mean for most motors that I have seen—that the positive components contribute to each winding most of the power according to their position on the stator. It keeps it running, and it has its own inertia and weight. There is a bit of twisting on the shaft in there which you have a hard time detecting because of the pulsation.

Presiding Examiner: The stator is the outside of the generator?

The Witness: Yes. The word "stator" indicates stationary, for example. That is how the word was coined.

In Exhibit 34, which is an approximation which I specified in my testimony as a steady state, or the old tracing method—the reason why I tried to distinguish was that tracing principles are used in the steady state method, and in the commingling method, and the system studies method. They all employ the procedure of tracing. So, to distinguish the method from the principle at least for my purpose, I use the so-called steady-state method. In the steady state method, one of the criterion or one of the principles is to approximate these three separate buses by single bus. Once you do that and you use the averaging

type of meters, you cannot show the effects which take place physically.

Now, there are two ways of doing that. One is to adopt the concept of counter-flow, which I show, I think, in my testimony. It is a valid concept, if you use three phases as an ensemble, or to adopt a bus or treat a bus rather as a point, a tank, a reservoir, because by so doing you permit any transfer back and forth which has to take place physically as systems actually operate. That is the reason I prefer that approach.

It is equally valid, in my opinion, to assume counter-flows and get the same answer, but it is more difficult to apply when you consider three phases of the unit.

Presiding Examiner: Would you explain that again; why it is equally valid?

The Witness: Because in treating a three-phase circuit or three-phase bus as a unit, physically, each phase contributes a positive amount of power and also a negative amount of power in most systems that I have seen. If you are to account for what takes place, then you have got to treat the negative separately and the positive separately, and in so doing power has to flow in both directions; otherwise you can't get any answers.

I prefer for analysis, I think it approaches the physical facts, to treat a bus, which is three separate lines, insulated conductors, as a point a tank, or a reservoir, rather than treating it as a single conductor having positions for connections thereto.

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If you look at a bus, on the plane of the bus sideways all you see is just one conductor. That corresponds to Exhibit 34. If you look at a bus from the end of a bus, all you see is three dots. When I superimpose three dots, you always see lines coming from or to the three superimposed dots. Physically you can get a picture from the steady state method and the so-called commingling bus method.

You asked me to comment on the method suggested by Mr. Bivans. All Mr. Bivans' method does is go one step more in theory. He says, as I understand him, that we can measure averages, and for business purposes it is adequate. For most operating purposes, it may be adequate.

Why? Because fortunately, as the systems are today, the variations in frequency are cushioned by the great massive amount of spinning inertia or spinning mass, so we don't get any great variations of frequency.

The reason why that is important is that the phyiscal characteristics of your system vary with frequency.

For example, we have two phenomena, which I think may be helpful to understand why I say this. In actual physical systems we have three phenomena which are observable; the others are minor.

One phenomenom is that a conductor, as such, resists the flow of electricity; it shows its resistance by converting some of that energy into heat. We call it resistance.

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There is another phenomenom. If we pass a current through a wire, we establish a magnetic field around that

conductor which really is in the form of circles which spin out and out into space. If we vary this current from zero and back again, sinusoidally, this field begins at zero and develops to a full magnitude and then collapses again at zero.

The rate of change or the rate of frequency with which we make these variations affects the characteristic which we call inductance, namely, it is a characteristic of the conductor and the space about it to react to a change in current, and this has the effect of reducing the voltage which you impress on a circuit; not in the direction of the voltage, but at right angles to it. Usually, if you plot it as a diagram, as shown, for example, on Exhibit 58 by the solid black line, it would induce a voltage which would make a curve cross at about 90 degrees behind the zero. In other words, it would lag it, that solid black line.

Presiding Examiner: When you say 90 degrees, how would that look on the diagram?

The Witness: The same as the solid black line, placed to the right—the zero would cross above the arrow under "Time" there.

So there would be a negative part to the left and a positive rise to the right.

Presiding Examiner: It would be the same, but it would lag it; is that correct?

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The Witness: That is right.

Three, there is another phenomenom which is called——

Presiding Examiner: We will take a short recess.

(Whereupon, at 11:15 a.m., a recess was taken until 11:30 a.m.)

Presiding Examiner: The hearing will come to order.

Dr. Jessel, before you go on, after your theoretical interpretation you came quickly to a conclusion in which you compared the point versus the position. Could you restate that summary conclusion?

The Witness: Yes. The methods of analysis used are, of course, based on certain approximations of actual systems. There are several. One is the so-called steady-state method, where we treat the three phases as one phase, sir, as one single phase, and the actual position on that particular bus or conductor, of each in-going and out-going circuit.

Presiding Examiner: What would be the position?

The Witness: You would take a three-phase bus, they call it a single conductor. Each incoming circuit they call a single conductor, as shown on Exhibit 34.

For example, the G-2 is really three conductors coming into that bus. We call it one, for purposes of analysis. So is G-1. So in the steady-state method, the bus has no dimensions as such, but the bus permits attachment to it of the incoming and outgoing circuits as actually occur

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physically, without regard to how far apart they are or anything. So that analysis is based entirely on the net average meter readings which are used in the steady-state method and they are the watt meter or the watt hour meter readings; nothing else.

Presiding Examiner: Based on them is this——

The Witness: Based on the wattmeter or the watt hour meter only. So by the approximations I stated in my testimony, the procedure then is to come in from each source and then by arithmetic trace through the various sources which you assume to be correct.

Actually, the physical data aren't this way at all. They show you, like on Exhibit 34, which shows that always the power is coming from G-2 to L-2. The data show that power, for example, also on 34, shows that power is going from G-1 to L-1. The actual physical data performance shows that G-2 serves L-2 alone; at times it serves L-1 and L-2, and at times G-1 serves L-1 alone, and at other times it serves L-1 and L-2 as shown from the diagram I have been discussing this morning.

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Presiding Examiner: When you say the physical data shows that, what do you mean?

The Witness: These type of data which I was trying to show you, these actual phase-by-phase relationships.

Presiding Examiner: You mean if you put very sensitive instruments you would get those phase——

The Witness: On each phase for instance. You put them on each phase now, you can measure them on an oscillograph,

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but not single phase wattmeters because they won't show there.

There are two ways of showing this phenomenon which in actual fact shows that the power flows are not as indicated by Exhibit 34, but they do go in both directions from each generator. One way would be to have counter-flows, to show areas of power flow in both directions from each generator, or to treat the—to collapse the bus as a point or call it a tank or a reservoir, so you don't have to concern yourself with the intricacies of what happens on the bus itself.

Presiding Examiner: In the other method you said they considered—you said they used the average. Why does the average result in not using the bus as a single point? What is the connection between those two factors?

The Witness: My explanation probably wasn't too clear; that every method, the steady-state, so-called commingling and the systems studies method of Mr. Bivans, all use the same kind of meters; they use watt meter or watt hour meter. Mr. Bivans method uses one additional meter, the reactive KVA meter.

What I am saying is to account for what happens physically on a system and on a bus as closely as possible, you have several choices. What I am saying is Exhibit 34 doesn't account for anywhere near what happens. The commingling method accounts for it in the form of a basket.

In other words, it is all-inclusive; you don't care what happens between the points.

Now, the third point, Mr. Bivans' method, which I am

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familiar with, I have used it for other purposes. They say "Let's go back to our meters and make another approximation."

Let us say, for example, that the power curve, which is on either Exhibit 58 or 59—maybe 59 will be easier to refer to. Let us say that under that method we break down that power curve into two components such that one is always positive and the other is positive and negative, such that the positive and negative areas equalize each other.

Presiding Examiner: Before he breaks them down, he has averaged the three phases?

The Witness: That is correct.

Presiding Examiner: He averages the three phases and then he divides them into two components?

The Witness: No. It is done a litle differently.

Fortunately for the power industry we do have what we call mathematically linear circuits, namely, that mathematically we can subdivide and actually measure by properly designed instrumentation components of a power system cycle, a power wave, and average the power component of the power wave above the zero line and also measure the component of the power wave which cancels out above and below the zero line.

The theory behind that is this, the power industrys' metering system is based on one principle, namely, obtaining the equivalent of direct current circuits. That is what it does. So a watt meter or a watt hour meter will take for you and

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measure the area—therefore, on Exhibit 59—above the zero line and substract the area below the zero line and give

you an average for each phase. That is the same electrically as though we had two power waves, one never below zero and one with a component above zero and below zero, and each of these components being equal as to area or average magnitude.

Now, we also have means of separating and measuring this component which is just above and just below the zero line at equal areas above and below. That is the component which Mr. Bivans uses in his method, megawatts and megavars. Under that method the theory is that any power contribution on a transmission system may be broken down mathematically into two components which equal the total.

Although in fact they are not that way, mathmatically they work them out that way in theory, which is the so-called root mean square method. I won't go into the matter of it, because it is not important.

In so doing, his Exhibit 46, in which he makes changes on mine, he shows an additional quantity which is shown in red. You notice 15 Mvar to the right and coming from Generator G-1 he shows it. Now, this method is a mathematical approximation which breaks down these power waves of Exhibit No. 59 into components, but it still says that all the power for load L-1 comes from G-1 and all the power for Load L-2 comes from G-2, and that is not a fact. So that is why I say it is not as good a method as the commingling

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method, where you treat a bus as a point or a tank or a reservoir instead.

Presiding Examiner: You say by instrumentation you can demonstrate it?

The Witness: By oscillograph I can demonstrate it.

Presiding Examiner: You can demonstrate at some times the power for Load L-2 comes from G-1?

The Witness: That is right. And, also, there are times when the power for L-1 comes from G-2 as well as G-1.

Presiding Examiner: You mentioned the fact that he broke the power components into two parts. What are the power components that he breaks them up?

The Witness: I tried to describe them to you.

Presiding Examiner: What do you mean by power components?

The Witness: Mathematically if you square the megawatt quantity and would square the megavar quantity and take the sum of the squares, you will get—this is moment by moment, by the way—the actual power curve as shown by Exhibit 59. So mathematically and engineering-wise, we call that power components.

Presiding Examiner: And it is those that he divides into two parts?

The Witness: That is right.

The method which he uses divides actual moment to moment power waves into two moment to moment power waves, and they are

averages of separate components of the power waves.

Presiding Examiner: He first gets a kind of an average amount of power as his first step?

The Witness: That is what the watt meter shows also the watt hour meter.

Presiding Examiner: He divides that into two parts?

The Witness: No. He doesn't do that, quite, either.

Let me start again: The watt meter and the watt hour meter measure the average—the net average amount of power for each phase, add them all together. That gives him megawatts for each phase and the arithmatical total for the three phases. Then he goes out and measures the component of current lagging behind the voltage by 90 degrees.

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Presiding Examiner: That is what bothers me. What is this component of the current that is lagging behind 90 degrees?

The Witness: Let me backtrack. I didn't want to give you the arithmatical theory, but I will have to now, I guess.

In electrical theory it has been shown mathematically that you can take this particular—let me show you the one I mean, referring to Exhibit 58. You can take the current curve, which is the cross-hatched wave, and divide it into two components such that one component coincides, time-wise, with the heavy black line; the other component, then, will be displaced from that black line by 90 degrees.

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Presiding Examiner: What do you mean by that? You mean it will lag, so it will be down, the thrust of the curve——

The Witness: Will be up, such that their sum will equal the detached line.

In that theory you measure each component separately times the voltage. That is how you do it. So, as I explained, the reason why I feel at least that Mr. Bivans method is not as near to the actual physical fact as the commingling method, it does not show the contribution, power-wise, instance by instance—it has no means of showing the contribution by each generator to each load. That is my main reason.

Presiding Examiner: Read that last sentence.

(Record was read.)

Presiding Examiner: And again, what is the reason for that?

The Witness: Because this method does not show in actual fact that is the way it happens, and I am trying to show a method that corresponds as closely as possible to what actually happens. The only way that I know of is by

using bus as a point or having counter-flows, which are the methods used today—it is not a new method, commingling; it has been used for years. Experts in the field have used it in the past, as far back as '41 and '42. That is the reason why they did it, and I agree with them.

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Ernest L. Bivans

resumed the witness stand, and, having been previously duly sworn, testified further as follows:

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By Mr. Martin:

Q. Mr. Bivans, this letter from Mr. Simonds of Florida Power Corporation has two pages of tabulated data. Would you take a look at the data, which are very simple, on those two pages, and state whether you agree that this data consists of readings from recording meters by Florida Power Corporation, showing a power flow at Archer and Deland West through the 120/69 KV step-down transformer?

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Q. Mr. Bivans, do you have any knowledge that the power flow at the Deland West and Archer substations was not from 120 to 69 kv bus as shown in Mr. Simonds' letter? A. Are you talking about all of the time or these few particular hours which are tabulated on here?

Q. During the hours set forth in the tabulation. A. I have no knowledge as to the accuracy one way or the other. But it is interesting to note the paucity of the readings available for the number of hours that are contained in Staff's Exhibit No. 18, which this period covers.

(700)

Presiding Examiner: You mean there is a very small amount of data?

The Witness: Yes, sir. For example, at Deland West there are only 11 readings out of 33 hours, and 20 readings at Archer out of some 33 hours contained in Exhibit 18.

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The Witness: I would like to add this, in conversation with Mr. Simonds he has indicated there have been times that power has flowed both ways. Under what circumstances, I don't know.

Presiding Examiner: By both ways, what do you mean specifically? Which are the two ways?

The Witness: According to this, it shows that the power is flowing from the high voltage system through the auto transformer to the 69 side. There have been times when the power flow has been reversed from the 69 side into the 120 kv side, which is in accordance with my testimony on page 34.

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By Mr. Martin:

Q. Mr. Bivans, in connection with your testimony regarding the kind of energy exchanged by Florida Power and Light Company on pages 7 and 8 of your direct testimony and your comments concerning scheduled exchanges on page 47 of that direct testimony, at this

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time I would like for you to look at the Turner plant daily operating report which is contained in Exhibit No. 36. It is this large green exhibit. A. Excuse me, Mr. Martin, will you show me on page 47 where I discuss any scheduled energy?

Q. Yes. If you would please look at the Turner plant daily operating report for the days of September 19 and September 21, 1964—

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Q. Mr. Bivans, would you look on the Turner plant reports for these two dates, at the information under the heading "Sanford-SW 6630" and the MW information regarding Sanford and tell us how you would describe the direction of the flow of power over the Sanford tie on these two days?

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A. On September 21 the direction of flow is in the direction from Turner plant toward Sanford except for the hours of

1 p.m. and 2 p.m.

Presiding Examiner: What tells you that?

The Witness: The plus in front of the megawatt figure indicates the direction of flow. That means it is flowing from Turner toward Sanford, just as if the megavar flow has the same connotation and direction. You note most of the time it was zero.

Presiding Examiner: What is there about the hours 1 and 2 that indicates a difference?

The Witness: Slight variation in voltage between the Sanford plant and the Turner plant.

Presiding Examiner: No, how is it—what is there different about those two hours?

The Witness: I am sorry, I was looking at September 21. What date was that?

Mr. Martin: You gave 21.

The Witness: It was minus 3 and zero for those two hours.

The other date?

(704)

By Mr. Martin:

Q. The other date was September 19. A. On September 19, the direction of power flow was from Turner towards Sanford for all hours in the day.

Q. That was from Florida Power Corporation to Florida Power and Light Company, is it not? A. Yes, sir.

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Q. On September 19, the maximum hourly reading on the Sanford tie is 36 mw, is it not? A. Yes.

Q. On September 19, the minimum hourly flow is 12 mw, is it not? A. Yes, sir.

Presiding Examiner: At what hour is the 12?

The Witness: It is at 5 p.m. and again at 12 midnight.

By Mr. Martin:

Q. According to a Staff tabulation on average hourly power flow, on September 19 the average flow was determined to be about 24 mw. Would you say that appears to be approximately correct without having to add all these figures? A. The average hourly flow—

Q. Flow during the entire day is approximately 24 mw. A. You can get that easily enough by looking down here in the other part of the sheet and you will see for the day is 583 megawatt-hours and if you divide that by 24 you will come up with some average hourly figure.

Q. Then would you agree that this is approximately correct? A. Is what approximately correct?

Q. Is 24 approximately correct? It is merely an average of the readings for—

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The Witness: Yes, that is correct.

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Q. Would you tell us whether the systems study method which you presented has any counter-flows of power? A. It has no counter-flows of real power.

Q. When you gave your answer with respect to counter-flows of power, did you consider each phase of a three-phase system separately, or did you treat all of three phases as an ensemble or as a unit? A. I treated it as a unit, but frankly I don't see where it makes any difference.

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Q. At the time of your system peak in 1964, January 14, 1964, between 6 and 7 p.m., what was the nature of the 18,000 kw that you were delivering to Florida Power Corporation? What kind of an exchange was that, economy exchange? A. We have no economy exchange. I don't know what our purchase schedule was for that date. I know we were purchasing power, and those figures are the actual recorded flows between the companies, and there usually is some discrepancy between what your actual scheduled purchases are during emergency and what the actual flows are, and that difference is called the inadvertent. I suspect that 18 megawatts was an inadvertent flow.

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The Witness: If you take this diagram identified as Exhibit 69 and you start with first of all a substation with a bus designated as A, B, C, D, E. To this bus are connected two generators, two lines and a load. Now, you will note from the diagram and the power flows thereon that all of the power that is supplied to point A on this bus and onto load 1 comes from Generator No. 1. All power going from Point B toward Point C comes from

(762)

Generator 1. All energy going from Point E to Point D on this bus comes from out of state as shown on the diagram. At Point D power from Generator No. 2 joins with the interstate power coming from Point E on the bus. Now, after joining at Point D this power is then commingled within the definition as described by Dr. Jessel and is shown flowing in the bus toward Point C. At Point C the power coming from Point B in the bus section and the power coming from Point D meet. Then the power going from Point C over the transmission line to Point F is commingled

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power, as shown by a square with the magnitude of the power, 100 megawatts. F-G represents a substation bus serving load 2. The power going from F towards G on this bus as well as the power continuing on the transmission line towards Point H, as shown by the broken squares cannot with certainty be classified as commingled power because it is impossible to establish as a scientific fact which source is supplying these loads.

Presiding Examiner: When you say these loads, what do you mean?

The Witness: I am talking about Load 2 and the power going towards Point H on the line.

Now, it is interesting to note that on the substation bus, A, B, C, D, E, has both electrical and physical dimensions. It shows power flows within the bus, and it also shows there can be commingling at a point on the bus.

Now, let's go down to the substation bus F-G. Although substation bus F-G has both electrical and physical dimensions, because of the way the transmission lines are connected to this bus and because only one load is served from this bus, the flow of power in the bus has to be the same as the flow of power in the load, and, therefore,

this bus may be considered a point within the definition as used by Dr. Jessel.

Presiding Examiner: That is F-G?

The Witness: Bus F-G. I think this is the simple

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explanation of all of these things that have been bandied around here during this hearing: commingled, steady state, bus is a point and so forth.

Presiding Examiner: You mean Bus A, B, C, D, E has dimensions?

The Witness: Has dimensions.

Presiding Examiner: And you would say Bus F-G doesn't?

The Witness: Bus F-G does have dimensions, but all the power split takes place at one point on that bus which is Point F, so therefore I can call that a point.

Presiding Examiner: In other words, it is only flowing one way in the bus?

The Witness: That is right.

Presiding Examiner: Whereas in Bus A, B, C, D, E, you have——

The Witness: Power flowing in both directions and different quantities of power flowing in different sections.

Mr. Merriman: Your Honor, I would just like to let you ask questions about this.

Presiding Examiner: In Bus A, B, C, D, E, does the power flow through that in the sense of flow or is there an instantaneous amount of power at all parts of the bus simultaneously?

The Witness: There is an instantaneous amount of power at all times. For example, take the bus Section B-C which shows 25. I assume that is 25 megawatts. There are three

bus conductors on there, and assume this is three-phase power. On an instance by instance basis this three-phase power is constant, and I have some other information that shows that.

Presiding Examiner: In other words, at any given instance there couldn't be, say, a greater amount of power at Point D or Point E than there would be at Points A or B, the amount of power at any point on the bus would be the same?

The Witness: The amount of power on any bus section is the same. It so happens that the values reflected on this one— I have 25 in one bus section, 25 in another bus section, and 25 in another bus section—may be a little bit misleading. Those three 25's have no relation to one another other than the fact that Point D indicates the disposition of the 50 megawatts from Generator No. 1.

Presiding Examiner: My question is, let's assume then between D and E, and entering at E, there were 75 megawatts—let's make it coming from out of state to Point E there are 75 megawatts instead of 25, would there be any point on the bus, then, at which power would not be evenly distributed at any point in time?

The Witness: Let's take your question. If you have 75 megawatts coming into the bus at Point E, then the flow in the bus section at exact same instance from E to D will be 75; then that 75 will add with this 50 coming from Generator

766

No. 2 at Point D and continue on to Point C as a total amount of 125 megawatts. Now, to the left of Point C those values would not change. The change would take place in the transmission line from Point C down towards Substation F-G.

Presiding Examiner: Do you call A-B, B-C, and C-D bus sections?

The Witness: Yes, sir. I call them bus sections in the sense that it is that part of the bus between points where components of your system are connected to.

Presiding Examiner: Then it is possible to have different amounts of power in different bus sections of the same bus?

The Witness: Oh, yes, sir.

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Surrebuttal Testimony of Joseph J. A. Jessel

Q. Would you please state your name? A. Joseph J. A. Jessel.

Q. Have you studied the testimony of Mr. Ernest L. Bivans referred to on page 775, lines 16 to 24, of the transcript of the proceedings in Docket No. E-7210? A. I have studied that testimony.

Q. Did you also study the exhibits sponsored by Mr. Bivans? A. I did.

Q. Would you identify the exhibits of Mr. Bivans which you studied? A. I studied exhibits 67, 69, and 70 sponsored by Mr. Bivans.

Q. Please refer to page 761, lines 4 to 18—do you have the reference? A. I do.

Q. There is much discussion in the record with respect to what constitutes a bus. Would you please state what a bus is comprised of? A. Each bus is comprised of three electrical conductors in the ordinary three-phase substation. Each conductor has physical dimensions of length and cross-sectional area. Each conductor has mechanical properties of weight, tensile strength and compressive strength. Each electrical conductor has electrical properties of resistance, inductive reactance and capacitive reactance (Tr. 137-138) which

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are usually so small in relation to other parts of an electric system, that they are taken as being zero for most study purposes.

Each phase conductor may be in the form of rigid bars, either in circular, rectangular or angular cross section or in the form of stranded copper, aluminum, aluminum alloy or steel overhead cable held under tension.

Each phase conductor is separated from each other phase conductor in space and is insulated from each other phase conductor from the ground.

Each of the three phase electrical conductors of a bus serves as a common connection to the corresponding phase of two or more three-phase electrical circuits. This means that all of the phase A conductors of all of the three phase transmission circuits are connected to the A phase of a bus, that all of the phase B conductors of all of the three phase transmission circuits are connected to B phase of a bus, and that all of the phase C conductors of all of the three phase transmission circuits are connected to the C phase of a bus.

Q. Does the Steady-State Method of roughly approximating an actual electrical system (Tr. 153-158; Exh. No. 48) take into consideration the physical dimensions, mechanical properties and electrical properties of each of the three insulated electrical phase conductors of a bus? A. No.

Q. Does the Commingled Method of roughly approximating an actual electrical system (Tr. 158-163; Exh. No. 48) take into consideration the physical

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dimensions, mechanical properties and electrical properties of each of the three insulated electrical phase conductors of a bus? A. No.

Q. Does the System Studies Method of roughly approximating an actual electrical system (Tr. 259-260; Exh. No. 48) take into consideration the physical dimensions, mechanical properties and electrical properties of each of the three insulated electrical phase conductors of a bus? A. No.

Q. How is an actual three-phase bus at a substation approximated in the Steady-State Method of analysis? A. An actual three-phase bus is approximated in the Steady-State Method of analysis by a single conductor bus, having some length but no specific amount of length, on which the actual position of each incoming and outgoing three-phase circuit is shown by use of a single conductor, and having zero resistance, zero inductive reactance and zero capacitive reactance.

Q. How is an actual thre-phase bus at a substation approximated in the Commingled Method of analysis? A. An actual three-phase bus is usually approximated in the Commingled Method of analysis by a point, sometimes by a tank or by a reservoir. When one of the basic engineering concepts includes counter flows of power, then the actual three-phase bus is approximated in the same way as for the Stead-State Method of analysis.

Q. How is an actual three-phase bus at a substation approximated in the System Studies Method of analysis?

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A. An actual three-phase bus is approximated in the System Studies Method of analysis by a single conductor bus having some length but no specific amount of length on which the actual position of each incoming and outgoing three-phase circuit is shown by use of a single conductor, and having zero resistance, zero inductance and zero capacitive reactance.

Q. Do the Steady-State, Commingled and System Studies methods have anything in common? A. Yes, all employ

the tracing procedure and all are based on the use of watt-meters or megawatt-hour meter readings.

Q. Would you refer now to page 767, line 4, and continue to page 769, line 12—do you have the reference? A. I do.

Q. Do you have Exhibit No. 70 before you? A. I do.

Q. Exhibit No. 70 shows a single phase power curve, what kind of a curve is it? A. It is a sine squared curve rather than a sine curve. As shown by Exhibit No. 58 it is obtained by multiplying together the instantaneous magnitudes of voltage and current which occur at the same instant of time.

Q. On Exhibit No. 70, there is shown a straight line which is designated as average value of single phase power—what is this so-called average value of single phase power?

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A. This average-value-of-single-phase-power line is a mathematical representation of a constant net power magnitude such that the area of the rectangle, enclosed within the horizontal lines of zero and one and the vertical boundaries for the one cycle range equals the sum of the areas under the sine squared curves located above the zero line less the sum of the areas of the sine squared curves located below the zero line. In other words, the average power flow in the positive direction may be represented on Exhibit No. 70 by a horizontal line such that the area of the rectangle that it would form with the zero line and the one cycle vertical boundaries would equal the sum of the areas of the portions of the sine squared curve located above the zero line. This horizontal line would be located at a place where it has a vertical scale reading of say 1.2. Similarly, the average power flow in the opposite or negative direction may be represented by a horizontal line below the zero line such that the area of the rectangle it would similarly from with the zero line would equal the sum of the areas of the portions of the sine squared curve on Exhibit No.

70 located below the zero line. This horizontal line would be located at a place where it has a vertical scale reading of say —0.2. These positive and negative average power flow lines would indicate accurately the directions of power flow whereas the average-value-of-single-phase-power line on Exhibit No. 70, which is the net average value of single phase power, also called net average power, does not present as true a picture because it indicates a power flow only in one direction by eliminating the other direction.

Q. Is net average power also called average value of single phase power on Exhibit No. 70 measured by usual commercial meters used by electric systems?

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A. Yes. Wattmeters and watthour meters measure only the net average amount of power of a cylic power curve as shown on Exhibit 70, because they always subtract the amount of power flow in one direction from the amount of power flow in the opposite direction.

Q. On page 767, lines 13 to 15 and as indicated by the horizontal three-phase power line on Exhibit No. 70—Mr. Bivans testified that on a three-phase power system—and you take all of the power flow on all three of the phase wires instant by instant—they will appear as this straight line—do you agree with this view? A. I do not.

Q. Would you state your reasons? A. There is no such thing as three-phase power as a physical reality. Electric power is transmitted by each of the three phases separately. This can be demonstrated easily by taking the output of phase A of a generator and transmitting it along route 1, the output of phase B of the same generator and transmitting it along route 2, and the output of phase C of the same generator and transmitting it along route 3. An oscillograph will show a power curve for each phase as shown by Exhibit No. 59. Connection of the three separate single phase circuits at the receiving end will supply adequately the needs of a three-phase load.

Three phase power as shown by the three-phase horizontal line on Exhibit No. 70 has only mathematical significance. It is obtained by the algebraic addition of instantaneous power quantities. This means that instant by instant the magnitudes of instantaneous power quantities occurring at the same time are added together is this way. The instantaneous power quantities shown above the zero line on

Exhibit No. 59 are added together and from this sum there is subtracted the instantaneous power quantity below the zero line to obtain the instantaneous net power quantity. In other words, the three-phase horizontal power line on Exhibit No. 70 represents a mathematical representation of net three-phase power. Any net quantity only represents unidirectional power flow because in its development other directions of power flow are automatically cancelled out. If the three separate phase powers are to be considered as an ensemble, then a more realistic picture is presented by Exhibit No. 60 which reveals that there are power flows in two directions as shown by the portions of the curves above and the portions below the zero line.

Q. Would you explain your last answer in relation to Mr. Bivans' testimony beginning on page 768, line 2 and continuing to page 769, line 12? A. The references relied on by Mr. Bivans are clearly mathematical approaches to electrical theory and they give no insight to actual physical phenomena. This is clear from the reference to equations which are only mathematical expressions. I have used similar mathematical methods in teaching electrical theory and I have read many books on the subject. My main observation has been that most writers of engineering texts fail to distinguish between mathematics, approximations, and physical reality.

Q. Is net three-phase power measured by the usual commercial watt-meters and watt-hour meters? A. Yes.

Q. Would you explain how net three-phase power is measured by the usual commercial watt-meters and by watt-hour meters used by the electric systems?

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A. Net three phase power is all that is measured by watt-meters. Such measurements may be made by three single phase meters, by two single phase meters, or by a three-phase meter which is in effect, mechanically combines the readings of two single phase meters.

When three single phase meters are used, each single phase meter measures the net average power of its phase and the three readings, one for each phase, have to be added together.

When two single phase meters are used, each single phase meter measures the net average power obtained from line to line voltage and phase current and when these two readings are added together, the result is net three-phase power, as can be shown mathematically for balanced three phase-circuits.

The three-phase meter measures net average power in the same way as in the two phase method but adds the readings together mechanically and gives directly the net magnitude of three-phase power.

Each method gives the net amount of three phase average power which is a mathematical number rather than a representation of physical fact. The most commonly used meters are the three-phase wattmeters because they give the three phase net reading directly.

Watt-hour meters operate in the same manner as watt-meters except that they accumulate power quantities to give energy readings. Thus, two watt-hour meter readings taken one hour apart, give net integrated power for the hour, this being the average net power for the hour. Sometimes, watt-hour meters are ratcheted to read average energy flow only in

one direction. Usually there are two such meters, one reading net energy flow in one direction and the other reading net energy flow in the other direction.

Q. Please refer to page 762, line 9 and continue to page 764, line 3—do you have the reference? A. I do.

Q. Would you also refer to Exhibit No. 69 sponsored by Mr. Bivans—do you have it before you? A. I do.

Q. Have you studied Exhibit No. 69 and the testimony to which I have just referred? A. I have.

Q. What method of analysis is indicated to you by Exhibit No. 69? A. Mr. Bivans did not state what method of analysis he used. Because of the absence of RKVA readings, I consider Exhibit No. 69 to be a diagram using the Steady-State Method of analysis.

Q. On Exhibit No. 69, there are shown arrows with numbers beside them. What are these arrows and numbers? A. These numbers represent megawatts as may be taken from an indicating wattmeter or from an integrating watthour meter from which integrated readings of megawatts may be obtained. In either case the figures represent net average three phase power, which are mathematic rather than physical quantities. The arrows indicate the direction of net average three phase power.

Q. Using the "Steady-State Method" of analysis, would you state what is shown by Exhibit 69? A. Exhibit No. 69 shows that: 25 more average megawatts were delivered to locations E and D than were supplied across the state line from locations E and D; 50 more average megawatts were supplied by generator 2 to D than were received by generator 2 from D; 75 more average megawatts were supplied from D to C than were supplied from C to D; 50 more average megawatts were supplied by generator 1 to B than were supplied from B to Generator 1; 25 more average

megawatts were supplied from B to A to load 1 than were supplied from load 1 to A to B; 25 more average megawatts were supplied from B to C than were supplied from C to B; 100 more average megawatts were supplied from C to F than were supplied from F to C; 50 more average megawatts were supplied from F to G to load 2 than were supplied from load 2 to G to F; and 50 more average megawatts were supplied from F to H than were supplied from H to F.

The Steady-State Method shows that out of state power is supplied to load 2 and to H but it does not show whether out of state power is supplied to load 1, whether generator 1 also supplies some power to load 2 and to H, whether generator 2 also supplies load 1 and whether generators 1 and 2 supply power across the state line. Other methods of analysis plus more data would supply the additional indicated information.

The Commingled Method of analysis would at least show that power from out-of-state, from generator 1 and from generator 2 would be supplied to load 1, to load 2 and to H.

In any event, Exhibit No. 69 shows a greatly oversimplified representation of a part of an actual electric utility system.

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Q. Would you indicate by a very simple example why you state that Exhibit No. 69 is a greatly oversimplified representation of a part of an actual electric utility system? A. Please refer to Exhibit No. 53 which is labelled Diagram B. By use of the Steady-State Method, the Commingled Method and the System Studies Method of analysis, the same result is reached that the 50,000 kw load is always served by generator A producing 50,000 kilowatts. Actually what takes place is as follows: generator A produces initially power and energy some of which are stored in the magnetic and electric fields in the region between the generator

and load and the rest is supplied to the load. Later on the output of the generator supplies exclusively the needs of the load. Still later on, the needs of the load are supplied in part by the generator and in part by the stored power and energy in the magnetic and electric fields, and a short time later the stored power and energy in the magnetic and electric fields provide power and energy to the generator and to the load. This process is repeated every complete cycle.

Q. Would you refer to page 763, lines 5 to 8 and state whether there are any difficulties in classifying mixed power as commingled power? A. There is no problem in identifying commingled power under the Steady-State Method and under the Commingled Method of analysis. Under the System Studies Method there appears to be a gap as to this matter. Actually one could use a tracer by adding a third harmonic 180 cycle component to the output of generator 1, a fifth harmonic 300 cycle component to the output of generator 2, and a seventh harmonic 420 cycle component to the power supply from out-of-state and each could be identified at locations F, H and load 2.

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Q. Would you refer now to page 763, line 11 and continue to page 764, line 10—do you have the reference? A. Yes.

Q. Would you state what relation electrical and physical dimensions of a bus have to Exhibit No. 69? A. As far as Exhibit No. 69 is concerned or as far as any of the three methods of analysis in the record of this proceeding (Exh. No. 48) is concerned, no method considers the resistance, inductive reactance and capacitive reactance of a bus. It makes no difference on Exhibit No. 69 whether points A,B,C,D and E are one inch apart or 100 feet apart, because the data thereon would be the same. If actual physical and electrical dimensions are to be used, then the actual electric

system has to be s[illegible]ied as it is and not in terms of some very rough approx[illegible]tion. In any event, the effect of the dimensions and electrical constants would be so small as not to show up on the usual meters used by the electric systems.

Q. Would you refer to page 764, line 11 and continue to page 765, line 16—do you have the reference? A. I do.

Q. What type of power flow data are discussed on the pages and lines I indicated to you? A. These power data are net average three-phase power quantities which are mathematical rather than physical quantities. The instantaneous amounts of power are not given by the net average three-phase power figures. It is true that there are instantaneous amounts of power at all parts of the bus simultaneously but they vary in amount and direction during each power cycle.

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Q. Please refer to page 761, line 17 and continue to page 766, line 14—do you have the reference? A. I do.

Q. Does changing the power flow from 25 to 75 between E and D of Exhibit No. 69 change your prior testimony as to Exhibit No. 69? A. No. All power quantities on Exhibit No. 69 remain as net average three phase mathematical power figures. They are merely net averages having no physical meaning.

Q. Please refer to page 770, lines 2 to 20, do you have the reference? A. I do.

Q. Is there any scientific, engineering or mathematical basis for "first in first out" concept suggested by Mr. Bivans? A. No. By using a harmonic tracer which I have already described, it can be shown that electric power and energy commingle.

Q. Would you refer to Exhibit No. 67—do you have it before you? A. I do.

Q. Would you describe the theory which underlies the real power and reactive power components shown on Ex-

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hibit No. 67? A. Yes. Reference to Exhibit No. 58 would assist in the explanation. As shown by the voltage and current curves on Exhibit No. 58, the current is zero after the voltage is zero and this means that the current lags the voltage. It can be shown mathematically that the current curve can be made equivalent to two other current curves, one current curve (A) crossing the zero line at the same places as the

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voltage curve crosses the zero line, and a second current curve (B) crossing the zero line at 90 degrees or half way between the points where the voltage curve crosses the zero line. Now current curves A and B can be so chosen mathematically that their sum instant by instant equals the current curve shown on Exhibit No. 58. The instant by instant product of the magnitudes of the points on the voltage curve and on the "A" current gives a power curve located above the zero line of Exhibit No. 58 but touching the zero line twice during each cycle. The average value of such a power curve is added together for each phase of a three-phase system and this is what is shown as "real power" on Exhibit No. 67. This is also what a three-phase wattmeter or watt-hour meter would actually read. The instant by instant product of the magnitudes of the points on the voltage curve and on the "B" current curve gives a power curve having equal areas above and below the zero line on Exhibit No. 58. The average value of such a power curve for a half cycle is added together for each phase and this is what is shown as reactive power on Exhibit No. 67. This is also what a three-phase reactive kilovolt-ampere meter would actually read.

The apparent power is obtained by taking the square root of the sum of the squares of so called real power and reactive power.

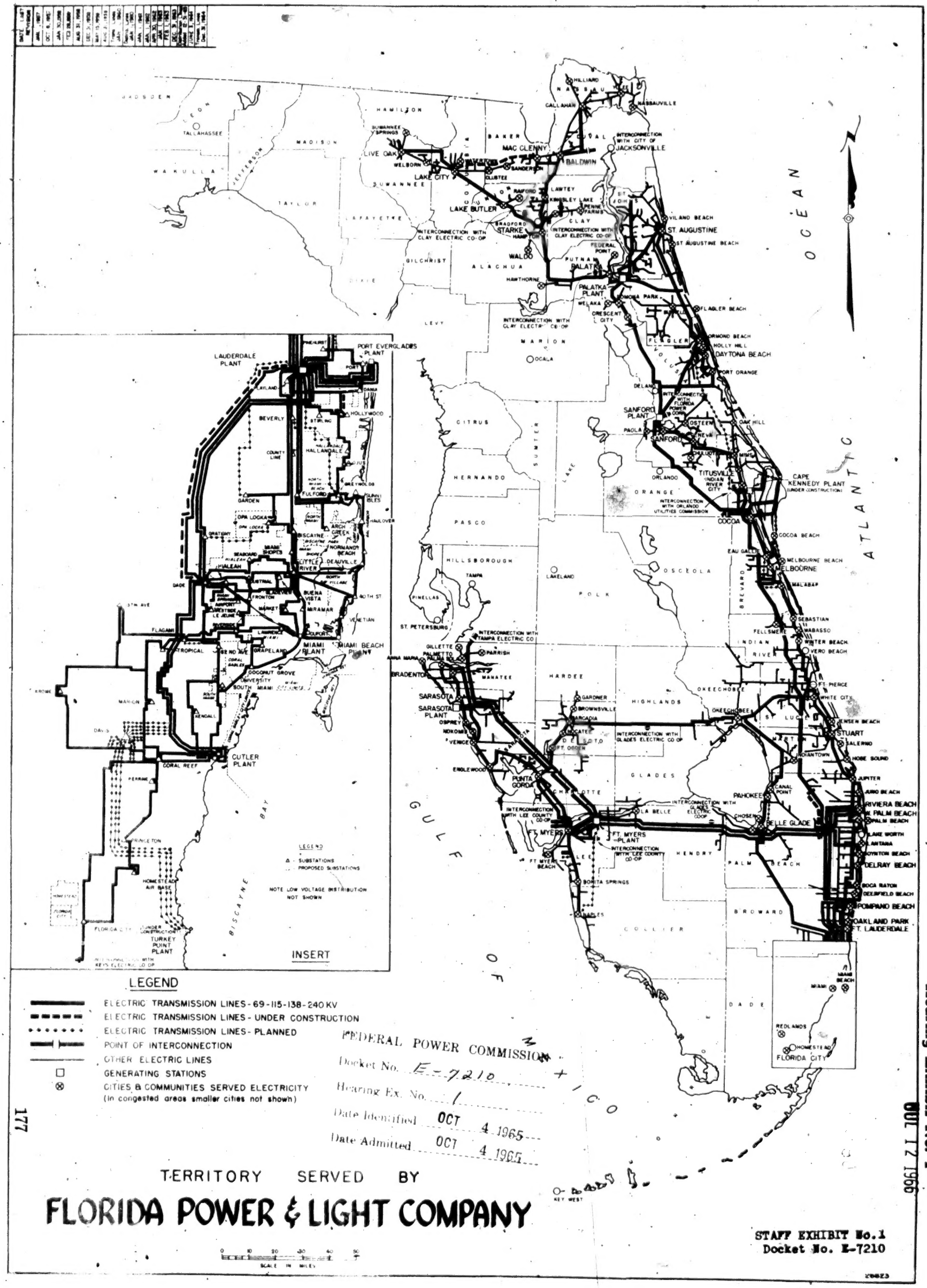
Q. Is there another mathematical theory which explains real power and reactive power? A. Yes. The voltage can be represented by a vector having a magnitude equal to the maximum value of the voltage on the voltage curve divided by the square root of two, and by an angle. The electric current

803 & 804

can be represented by a vector having a magnitude equal to the maximum value of the current on the current curve divided by the square root of two, and by an angle. The current vector can be represented by two vectors, one in phase or in the same direction as the voltage vector and the other vector at right angles to the voltage vector.

Three times the product of the single phase voltage vector and the in phase vector of current gives real power as shown on Exhibit No. 67. Three times the product of the single phase voltage vector and the 90 degree out of phase current vector gives reactive power as shown on Exhibit No. 67.

* * * * * * * * * *



FEDERAL POWER COMMISSION
Docket No. E-7210
Hearing Ex. No. 1
Date Identified OCT 4 1965
Date Admitted OCT 4 1965

TERRITORY SERVED BY
FLORIDA POWER & LIGHT COMPANY

STAFF EXHIBIT No. 1
Docket No. E-7210

Hearing Exhibit No. 1
OCT 12 1966
(903)

177

(935)

Hearing Exhibit No. 3

Attachment 5
M 18-64

SPINNING RESERVE AT TIME OF PEAK

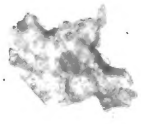
The five systems of the Florida Pool in late September 1963 began exchanging information daily on the amount of spinning reserve each expected to carry over the peaks. This data has been reviewed for the period October 1963 through March 1964 and the data for morning and evening peaks are given on the attached Figure 1. The data for evening peaks are also plotted in Figure 2.

During the four month period, November 1963 through February 1964 (104 days excluding Sundays), the total spinning reserve at the time of evening peak was less than the normal capability of the pool's largest unit (280 mw) on 22 days (or 21% of the days), less than 250 mw on 14 days, less than 225 mw on 11 days, less than 200 mw on 4 days, less than 175 mw on 2 days and less than 125 mw on one day.

Errors in forecasting the peak load constitute the principal cause of deficiencies in spinning reserve, and it is desirable to obtain some idea of the magnitude and frequency of this type of exposure. Since information was already available from the daily exchange on expected and actual spinning reserve, the forecasting errors have been obtained by taking the difference between these two values. The results are plotted on Figure 3.

It is noted that an allowance of 2% of the total load would have reduced the deficient days by one half and it may be desirable to consider some such safety margin in setting up a spinning reserve formula.

K. S. Buchanan
M. F. Hebb, Jr.
R. D. Welch
5/22/64



KSB/LAL
5/20/64

Figure 1
Attachment 5

SPINNING RESERVE AT TIME OF PEAK
OCTOBER 1963 - MARCH 1964 (Sundays Omitted)

OCTOBER 1963

Date	Morning Peak - MW						Evening Peak - MW					
	FPL	FPC	TEC	OUC	JAX	Total	FPL	FPC	TEC	OUC	JAX	Total
1	323	122	-		131	584	161	75	101		102	439
2	280	115	303		114	812	148	72	81		93	374
3	266	130	178		130	704	96	55	51		80	282
4	300	144	98		86	628	133	55	146		71	405
5	401	117	113		105	736	217	80	156		90	543
7	344	140	58		138	690	134	63	86		75	358
8	337	183	58		123	701	143	77	31		89	340
9	376	154	273		133	936	209	60	111		84	464
10	473	160	243		133	1009	223	133	96		96	550
11	496	255	138		143	1032	284	168	176		107	735
12	437	143	103		109	792	218	71	186		68	543
14	175	75	83		121	454	79	87	41		86	293
15	173	160	218		135	686	82	72	176		92	422
16	212	166	203		122	703	103	111	51		82	347
17	220	194	61		124	599	68	110	76		91	345
18	210	180	173		129	692	139	154	56		80	429
19	314	233	178		126	851	150	151	76		106	483
21	233	113	193		124	663	72	67	77		90	306
22	275	175	173		130	753	99	59	41		81	280
23	217	172	148		135	672	83	84	56		90	293
24	220	174	208		124	726	38	57	71		92	258
25	200	140	153		121	614	40	59	86		97	282
26	225	113	188		140	646	93	21	66		106	286
28	160	100	-		115	375	49	29	96		70	244
29	213	177	173		148	711	138	60	106		71	365
30	366	137	178		84	765	59	45	91		82	277
31	347	165	148		110	770	171	55	83		87	396

* Data incomplete

NOVEMBER 1963

Date	Morning Peak - MW						Evening Peak - MW					
	FPL	FPC	TEC	OUC	JAX	Total	FPL	FPC	TEC	OUC	JAX	Total
1	272	166	128	55	121	742	96	55	66	21	83	321
2	326	109	98	30	126	689	76	17	81	49	89	272
4	183	112	63	25	103	486	98	40	82	6	60	266
5	180	124	313	43	106	766	68	0	201	23	65	357
6	121	120	8	41	109	399	29	44	76	30	64	243
7	257	175	323	47	123	825	90	81	221	30	83	505
8	267	108	83	45	95	598	127	77	226	33	74	537
9	309	199	158	54	95	815	67	83	148	34	69	399
11	162	125	188	42	98	615	88	107	151	28	113	487
12	199	117	268	38	109	731	104	48	96	27	71	346
13	256	105	173	35	107	676	35	0	71	18	95	219
14	331	6	123	27	105	592	33	18	61	35	61	208
15	98	102	98	32	113	463	185	99	136	49	93	562
16	566	184	143	40	131	1044	289	104	101	26	109	629
18	268	187	103	36	124	718	107	108	56	19	81	371
19	274	203	168	40	132	817	75	121	76	21	79	372
20	281	215	93	40	133	762	86	87	77	21	85	356
21	282	170	103	40	131	726	100	54	71	23	77	325
22	239	129	113	32	129	642	184	90	76	23	89	462
23	277	159	143	47	154	780	122	75	81	33	115	426
25	270	153	153	44	112	736	36	78	51	26	74	265
26	184	164	153	34	96	631	61	73	91	22	71	318
27	168	125	173	40	85	591	105	81	51	24	82	343
28	321	143	83	58	114	719	385	229	161	66	154	995
29	263	157	68	50	109	647	126	34	136	35	85	438
30	100	55	268	36	106	565	165	-	58	35	84	342

DECEMBER 1963

Date	Morning Peak - MW						Evening Peak - MW					
	FPL	FPC	TEC	OUC	JAX	Total	FPL	FPC	TEC	OUC	JAX	Total
2	141	0	83	41	109	374	51	40	91	40	73	295
3	214	74	63	55	94	500	17	23	86	45	42	213
4	308	38	73	54	88	561	183	0	106	48	76	413
5	266	26	93	54	101	540	150	42	121	46	84	443
6	209	40	73	27	91	440	79	11	81	21	67	259
7	340	60	58	34	104	596	213	30	51	31	86	411
9	393	72	33	29	95	622	79	13	116	28	69	305
10	211	35	88	53	75	462	76	11	76	41	57	261
11	291	113	113	18	85	620	143	67	111	45	86	452
12	535	214	118	42	108	1017	148	60	46	23	72	349
13	510	173	83	40	116	922	141	93	96	23	89	442
14	309	233	153	49	131	875	83	96	81	31	87	378
16	253	0	0	36	117	406	12	31	51	31	67	192
17	294	107	88	51	103	643	90	66	76	37	75	344
18	339	211	128	51	118	847	147	121	81	40	95	484
19	36	150	68	36	85	375	14	89	16	21	96	242
20	59	17	88	40	134	338	71	89	43	37	122	362
21	139	116	73	28	118	474	88	99	36	25	82	330
23	471	280	138	33	105	1027	0	163	106	24	98	391
24	207	200	73	42	77	599	31	111	108	39	93	380
25	100	174	128	61	92	555	202	249	146	76	133	806
26	188	217	58	44	80	587	29	153	71	42	83	378
27	125	253	118	26	105	627	51	150	101	23	70	395
28	263	150	53	54	111	631	92	32	76	31	89	320
30	251	139	113	49	72	624	98	42	101	39	67	347
31	343	211	103	34	74	765	243	137	86	30	85	581

JANUARY 1964

Date	Morning Peak - MW						Evening Peak - MW					
	FPL	FPC	TEC	OUC	JAX	Total	FPL	FPC	TEC	OUC	JAX	Total
1	521	203	133	52	106	1015	210	124	126	44	116	620
2	35	154	118	116	111	674	5	53	66	13	73	210
3	57	59	68	14	81	259	168	78	41	24	92	403
4	399	104	98	36	109	746	228	67	47	35	88	465
6	396	197	143	32	107	875	176	108	86	24	75	469
7	377	267	188	43	100	935	100	189	71	27	81	468
8	370	278	173	41	101	963	35	142	66	24	84	351
9	372	284	153	41	110	960	62	118	71	22	90	363
10	388	86	188	34	86	722	22	7	71	11	74	185
11	485	100	173	34	58	770	192	89	61	31	81	454
13	258	114	68	14	77	531	17	0	91	0	35	143
14	22	8	113	16	26	185	25	0	0	22	39	86
15	63	235	105	24	69	496	50	185	38	33	48	354
16	276	225	43	44	93	681	67	262	86	-	82	447
17	349	289	128	-	102	868	174	161	51	48	110	544
18	215	125	148	49	67	604	39	95	121	47	63	365
20	321	273	136	32	115	877	77	147	62	24	88	398
21	201	166	103	20	84	574	95	116	74	18	77	382
22	357	193	103	32	104	789	105	184	42	28	67	426
23	263	179	138	41	136	739	128	127	72	25	87	437
24	208	213	133	39	137	730	135	129	156	26	104	550
25	478	176	168	49	80	951	193	61	96	35	80	464
27	298	72	23	23	91	507	50	90	71	24	72	307
28	355	117	135	31	87	725	153	60	56	25	87	381
29	272	32	78	21	84	487	60	83	46	18	65	252
30	388	27	113	27	84	617	81	23	81	20	63	268
31	404	176	133	37	94	844	174	165	86	27	71	523

FEBRUARY 1964

Date	Morning Peak - MW						Evening Peak - MW					
	FPL	FPC	TEC	OUC	JAX	Total	FPL	FPC	TEC	OUC	JAX	Total
1	509	146	88	50	113	906	220	35	41	35	70	401
3	356	53	108	30	84	631	36	46	46	29	58	215
4	337	151	148	31	85	752	66	70	46	34	61	277
5	371	172	128	39	93	803	169	110	76	27	77	459
6	372	209	123	37	87	828	120	188	111	27	77	523
7	374	111	128	35	96	744	116	52	81	27	94	370
8	312	133	42	33	90	610	190	0	36	32	88	336
10	222	28	68	35	78	431	91	70	91	43	70	365
11	269	111	113	27	78	598	88	11	11	40	58	208
12	21	8	22	36	53	140	56	40	85	45	37	263
13	73	128	68	51	79	399	160	134	56	49	47	446
14	352	161	123	36	85	757	91	110	81	24	96	402
15	459	138	103	48	115	863	208	131	67	38	95	539
17	320	113	113	32	89	667	216	160	78	26	67	543
18	408	262	185	39	102	996	124	196	91	29	81	421
19	409	88	123	33	99	752	110	32	46	21	63	272
20	156	78	88	24	75	421	83	70	61	16	82	312
21	44	46	18	44	88	240	114	70	61	11	75	331
22	40	40	93	25	61	259	71	99	51	19	76	316
24	100	115	153	36	66	470	98	168	25	46	62	399
25	372	233	50	55	107	817	130	220	30	51	87	518
26	341	228	90	52	88	799	153	248	11	52	63	527
27	423	257	130	55	82	947	129	209	22	45	55	460
28	354	309	245	64	100	1072	168	89	93	49	57	456
29	300	130	183	29	85	727	147	134	61	31	72	445

MARCH 1964

Date	Morning Peak - MW						Evening Peak - MW					
	FPL	FPC	TEC	OUC	JAX	Total	FPL	FPC	TEC	OUC	JAX	Total
2	310	282	23	38	99	752	92	240	71	25	72	500
3	305	306	93	40	102	846	107	238	53	21	80	499
4	353	296	138	36	94	917	141	234	46	22	77	520
5	313	311	93	34	103	854	80	247	101	33	93	554
6	429	223	73	38	89	852	159	276	106	32	98	671
7	395	308	68	55	120	946	162	191	98	39	90	518
9	214	255	68	30	79	646	108	187	186	13	40	534
10	223	241	88	32	85	669	74	143	168	24	75	484
11	263	235	63	40	75	676	68	177	116	23	78	442
12	197	263	73	41	71	646	96	187	61	24	74	442
13	271	233	108	36	67	715	135	198	51	31	84	499
14	329	221	123	47	91	811	103	114	51	34	72	376
16	151	169	98	37	74	529	133	104	91	27	51	406
17	300	183	203	47	75	808	200	89	231	31	63	614
18	357	157	133	44	83	774	116	75	143	32	78	444
19	375	175	138	45	83	816	90	88	181	29	80	448
20	289	157	178	39	85	728	107	88	111	29	72	407
21	142	129	148	50	95	564	170	85	151	40	70	516
23	370	5	198	39	69	681	149	35	126	29	62	401
24	250	99	8	47	85	489	122	36	121	31	75	385
25	217	109	48	43	99	516	95	40	161	28	65	389
26	90	76	93	36	84	379	146	98	166	33	122	565
27	126	78	143	49	70	466	124	135	191	37	84	571
28	197	66	23	39	79	404	79	70	226	40	74	489
30	263	37	33	34	80	449	47	4	151	25	56	283
31	301	59	153	30	76	619	117	34	141	27	69	388

NOTE: Underlined values indicate peaks for which total spinning reserve was less than 280 mw, normal capability of pool's largest units

TENTATIVE RECOMMENDATIONS *

READY RESERVE, SPINNING RESERVE & NON-SPINNING RESERVE

1. Ready reserve will be made of spinning reserve and non-spinning reserve.

   a. Spinning reserve is reserve capacity actually spinning on the line and available to take load immediately.

   b. Non-spinning reserve is any other reserve capacity which can be made available in ten minutes or less. This includes standing hydro, diesel and gas reserve generating capacity, interruptible loads and capacity that can be obtained by increasing turbine pressures or by cutting out feedwater heaters.

2. In normal operation enough spinning reserve will be maintained by the several participants to absorb the instantaneous loss of the largest generating unit in service. ~~Non-spinning reserve equal to half this amount will be maintained.~~ Ready reserve equal to one and one-half times the maximum capability of the largest generating unit in service will be maintained. At least two-thirds of the ready reserve will be spinning reserve and no more than one-third of the ready reserve will be non-spinning reserve.

3. The ~~spinning~~ ready reserve requirement and the ~~non-~~spinning reserve requirement for the pool will be divided among the participants in proportion to each participant's maximum demand for the preceding year and the maximum capability of his largest unit. Fifty per cent will be shared on the basis of demand, and fifty per cent on the basis of maximum capability of largest unit (See attached sample calculation)

4. Spinning reserve requirement and an equitable formula will be a continuing interest of the Florida Operating Committee. A new formula will be calculated and used when a system's single largest unit is off line or operating at reduced capability for seven days or longer.

5. Protection of a new unit during shakedown will be the responsibility of the owner.

6. Each participant's spinning reserve obligation must normally be available to the other participants and not be bottled up by transformer, line or other limitations. In abnormal situations where the spinning reserve of a participant is either unavailable or only partially available, such participant will notify the others so that their spinning reserve may be increased or reallocated as required.

7. Each participant's spinning reserve obligation must be distributed on enough generating units with proper governor characteristics, so that it will not take a frequency drop in excess of five-tenths of a cycle to realize the full benefits of each participant's share of assistance. Assuming 5% governors, this means that the reserve allocated to any one unit should be no more than 16.66% of the normal capability (high load limit) of that unit. However, (1) since there are usually a number of units, (2) since it is desirable to favor the more economical units with more load, and (3) since it is desirable to be conservative in the matter of allocating to any one unit, the following allocation may be considered:

   5 % reserve on 100 mw units and larger
   7½% reserve on 75 mw units
   10 % reserve on 50 mw units and smaller

HWP/WBS/HAT
5/14/64

* ...ected with changes 5/15...
...7/64

Hearing Exhibit No. 3

HWP/WBS/HAT 5-14-64 (939)

READY

A METHOD OF CALCULATING ~~SPINNING~~ RESERVE & ~~NON~~ SPINNING RESERVE OBLIGATION
BASED ON PEAK LOAD AND SIZE OF LARGEST UNIT

	Approximate Peak Load Gross MW	Capability of Largest Unit Gross MW
Tampa Electric Company	625	205
Florida Power Corporation	925	219
Florida Power & Light Company	2150	300
Orlando Utilities Commission	170	94
City of Jacksonville	460	140
	4330	958

Based on Peak Load

TEC	625	÷ 4330 =	14.43%	
FPC	925	÷ 4330 =	21.36%	
FPL	2150	÷ 4330 =	49.65%	
OUC	170	÷ 4330 =	3.93%	
JAX	460	÷ 4330 =	10.63%	
			100.00%	

Based on Largest Unit

TEC	205	÷ 958 =	21.40%	
FPC	219	÷ 958 =	22.86%	
FPL	300	÷ 958 =	31.32%	
OUC	94	÷ 958 =	9.81%	
JAX	140	÷ 958 =	14.61%	
			100.00%	

Average

TEC	17.92%
FPC	22.11%
FPL	40.48%
OUC	6.87%
JAX	12.62%
	100.00%

TEC	450 mw X 17.92%	=	80.64 mw
FPC	450 mw X 22.11%	=	99.50 mw
FPL	450 mw X 40.48%	=	182.16 mw
OUC	450 mw X 6.87%	=	30.91 mw
JAX	450 mw X 12.62%	=	56.79 mw
			450.00 mw Ready Reserve

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TEC	300 mw X 17.92%	=	53.76 mw
FPC	300 mw X 22.11%	=	66.33 mw
FPL	300 mw X 40.48%	=	121.44 mw
OUC	300 mw X 6.87%	=	20.61 mw
JAX	300 mw X 12.62%	=	37.86 mw
			300.00 mw Spinning Reserve

TEC	26.88 mw
FPC	33.17 mw
FPL	60.72 mw
OUC	10.30 mw
JAX	18.93 mw
	150.00 mw Non-spinning reserve by Difference

Attachment 6
M 18-64

Attachment 2
M19 - 64

SPINNING RESERVE AT TIME OF PEAK
APRIL - SEPTEMBER 1964

The amounts of spinning reserve that the five systems of the Florida Pool carried over morning and evening peaks are given in the attached Table 1 for the period April 1964 through September 1964.

During the three month period, June 1964 through August 1964 (78 days, excluding Sundays and holidays), the total spinning reserve was less than the capability of the pool's largest unit on 16 morning peaks (or 25% of the days) and on 6 evening peaks (or 8% of the days). The capability of the pool's largest unit was: 300 mw, June 1 - August 28; 425 mw, August 29 - August 31. The amounts by which the spinning reserve was less than the capability of the pool's largest unit, together with the number and per cent of days, were:

	Morning Peak		Evening Peak	
	Days	% of Days	Days	% of Days
5 mw or more	16	21	6	8
20 mw " "	14	18	5	6
50 mw " "	9	14	4	5
60 mw " "	8	10	4	5
75 mw " "	8	10	4	5
100 mw " "	5	6	4	5
125 mw " "	4	5	4	5
150 mw " "	2	3	4	5
175 mw " "	0	0	2	3
195 mw " "			1	1

Error in forecasting peak load continues to be the principal cause of deficiencies in spinning reserve. The magnitude and frequency of the deficiencies of each system during the three month period, June - August 1964, are indicated in the attached Table 2. The fact that the magnitude and frequency of deficiencies in total pool spinning reserve was much less than that of the individual systems was due to considerable diversity in load forecast errors and to the fact that expected and actual spinning reserve of each system was in excess of its obligation over many peaks.

K. S. Buchanan
10/26/64

KSB/LAL
10/26/64

Table 1
Attachment 2

946

SPINNING RESERVE AT TIME OF PEAK
APRIL 1964 - SEPTEMBER 1964 (Sundays Omitted)

APRIL 1964

Date	Morning Peak - MW						Evening Peak - MW					
	TEC	FPC	FPL	OUC	JAX	Total	TEC	FPC	FPL	OUC	JAX	Total
1	71	37	186	42	78	414	56	63	83	36	72	310
2	66	82	244	50	87	529	81	88	76	35	88	331
3	68	80	176	48	75	447	101	-1	130	35	71	336
4	111	124	127	51	88	501	53	44	6	42	78	223**
6	51	47	122	36	89	345	21	35	87	24	73	242**
7	76	46	158	35	76	391	41	-8	87	39	55	194**
8	86	41	238	54	57	476	61	45	100	40	50	302
9	166	130	274	72	152	796	91	117	128	58	120	514
10	136	107	269	47	114	673	76	110	133	36	100	355
11	126	145	317	54	95	737	66	65	204	47	65	447
13	136	100	168	37	66	507	231	72	120	48	66	537
14	171	104	205	61	75	516	181	95	85	47	75	483
15	231	143	151	65	83	673	208	145	123	54	83	613
16	192	109	255	67	77	700	224	116	129	55	78	602
17	192	114	274	43	73	696	139	120	181	38	83	561
18	102	110	351	55	81	699	124	75	189	45	61	494*
20	127	111	171	37	85	531	129	76	138	26	68	437
21	57	110	185	38	99	489	119	72	100	48	62	401
22	77	69	138	57	87	428	134	84	92	45	62	417
23	27	135	109	51	69	391	94	94	120	43	72	423
24	62	54	31	48	61	256**	119	37	115	40	85	396
25	112	148	96	37	76	469	59	80	185	28	62	414
27	107	103	89	48	74	421	134	111	25	42	72	384
28	112	166	132	60	76	546	194	157	135	66	64	616
29	222	184	163	63	83	695	154	115	106	47	72	494
30	112	193	65	50	72	492	119	151	80	34	50	434

MAY 1964

Date	Morning Peak - MW						Evening Peak - MW					
	TEC	FPC	FPL	OUC	JAX	Total	TEC	FPC	FPL	OUC	JAX	Total
1	122	130	185	58	77	572	174	128	137	63	96	598
2	127	105	131	49	98	510	199	88	54	34	78	453
4	52	167	315	46	83	653	147	180	203	38	72	[illegible]
5	142	207	293	45	81	768	259	119	111	33	68	590
6	182	185	283	40	75	765	204	102	143	32	72	553
7	172	205	243	38	79	737	208	114	100	30	59	511
8	182	165	224	35	66	612	198	57	107	25	83	470
9	107	289	352	44	65	857	78	208	214	31	60	591
11	92	120	50	41	70	373	216	95	6	29	70	416
12	166	132	62	41	83	484	181	80	199	36	112	605
13	146	123	40	42	85	436	171	100	111	33	112	527
14	191	133	239	56	80	691	208	135	145	52	95	635
15	186	206	180	58	90	720	161	149	137	58	93	598
16	106	207	366	41	107	827	58	135	258	43	90	584
18	106	134	86	26	110*	352	58	100	97	38	97	390
19	191	207	99	53	127*	550	158	137	103	46	94	538
20	126	132	88	51	125*	397	93	110	158	43	83	487
21	111	147	102	47	97*	412	83	100	74	40	51	348
22	111	155	67	49	92*	382	113	131	106	44	105	399
23	101	127	144	36	95*	408	78	110	153	36	95	472
25	126	81	51	21	93*	279**	51	73	149	36	84*	309
26	116	135	144	48	116*	443	41	78	112	38	75	344
27	126	114	129	44	108*	413	31	32	73	30	62	228**
28	106	66	121	37	81*	330	86	39	116	26	61	328
29	106	148	66	34	101*	354	66	79	141	29	95	410
N 30	101	150	219	44	81	595	71	123	169	36	105	504

JUNE 1964

Date	Morning Peak - MW						Evening Peak - MW					
	TEC	FPC	FPL	OUC	JAX	Total	TEC	FPC	FPL	OUC	JAX	Total
1	86	50	51	29	83*	216**	21	109	110	39	92	371
2	91	83	176	35	91*	385	171	80	143	26	57	477
3	96	88	72	22	101*	278**	83	68	118	27	73	369
4	86	108	102	37	89*	333	78	99	118	44	91	430
5	88	109	66	30	64*	293**	53	115	187	28	78	461
6	108	180	91	37	103*	436	83	160	146	34	75	518
8	76	71	99	31	51*	277**	73	52	203	0	36	364
9	36	59	28	29	31*	152**	16	49	210	23	17	315
10	60	72	99	26	30	287**	52	84	235	38	1	410
11	28	77	222	28	10	365	88	84	118	37	-6	321
12	63	61	118	36	27	305	93	48	103	34	58	336
13	123	142	176	41	76*	482	43	114	121	40	88	406
15	81	16	36	35	24	192**	41	8	14	29	13	105**
16	46	17	24	33	32	152**	25	22	23	24	14	108**
17	41	15	35	31	20	142**	20	31	60	14	8	133**
18	4	50	37	31	27	149**	27	83	115	28	22	275**
19	53	47	95	32	16	243**	28	124	97	31	3	283**
20	88	105	148	37	38	378	53	118	245	34	85	535
22	86	30	214	36	28	394	18	6	250	31	20	325
23	163	44	195	40	30	473	133	10	301	24	19	487
24	116	82	353	44	27	622	108	90	165	42	5	410
25	156	117	135	37	35	480	106	117	263	35	40	561
26	98	31	220	42	21	412	93	94	285	39	71	582
27	156	174	259	50	59	698	176	214	221	53	134	798
29	106	24	32	37	5	204**	81	69	200	38	4	392
30	121	126	147	26	10	430	91	185	275	51	-9	593

JULY 1964

Date	Morning Peak - MW						Evening Peak - MW					
	TEC	FPC	FPL	OUC	JAX	Total	TEC	FPC	FPL	OUC	JAX	Total
1	171	177	211	28	-8	579	136	187	238	36	-31	566
2	81	204	196	29	-19	491	151	187	260	28	-29	597
3	151	160	144	41	14	490	131	93	87	35	30	376
N 4	231	57	203	38	74	603	215	65	257	38	91	666
6	111	139	226	23	44	543	96	132	259	38	63	588
7	221	100	176	32	77	606	161	88	175	31	53	478
8	50	78	147	32	55	362	23	52	289	23	40	427
9	213	53	138	25	28	457	166	10	194	31	41	442
10	51	43	115	37	18	264**	101	132	213	31	72	549
11	161	153	132	40	116	602	156	178	182	44	147	707
13	61	-1	127	25	93	305	76	-8	223	34	122	447
14	91	98	126	22	88	425	112	19	178	30	77	416
15	136	82	187	24	69	498	131	112	276	19	77	615
16	156	133	353	32	73	747	146	134	420	37	79	816
17	61	102	277	42	84	566	66	217	177	47	118	645
18	101	200	294	45	102	742	76	171	230	45	87	609
20	96	27	75	23	49	270**	88	-24	200	32	34	330
21	91	39	182	6	88	406	66	136	194	32	74	502
22	86	32	140	29	91	378	81	163	220	20	84	568
23	146	146	193	38	75	558	111	192	403	35	83	824
24	116	59	210	34	80	499	91	207	334	31	108	771
25	121	292	232	50	79	774	131	337	347	54	99	968
27	191	93	252	38	112	686	186	213	179	34	125	717
28	151	42	111	27	75	406	146	92	196	17	63	514
29	171	48	166	21	70	476	111	131	181	30	48	501
30	151	20	151	32	46	400	116	131	175	24	99	545
31	131	24	169	30	51	405	121	141	298	27	45	632

AUGUST 1964

Date	Morning Peak - MW						Evening Peak - MW					
	TEC	FPC	FPL	OUC	JAX	Total	TEC	FPC	FPL	OUC	JAX	Total
1	186	162	238	31	66	683	196	176	89	44	90	595
3	101	125	244	26	75	571	106	71	155	30	24	386
4	108	63	166	14	64	415	96	107	464	19	45	821
5	146	57	136	25	82	446	111	172	365	17	70	735
6	116	90	177	20	86	489	106	207	197	16	98	624
7	106	97	229	20	87	539	111	258	176	17	107	669
8	72	229	153	33	90	577	72	233	131	31	86	553
10	151	131	230	12	47	571	116	262	219	25	82	704
11	131	144	207	21	100	603	151	242	288	21	81	783
12	86	48	156	21	70	381	116	182	153	18	60	529
13	136	30	117	28	92	423	146	148	175	28	92	589
14	16	72	185	19	80	352	51	182	308	19	55	615
15	76	232	367	37	93	805	50	191	290	34	86	651
17	46	2	126	24	66	264	16	147	178	22	49	412
18	73	99	271	13	70	526	80	193	227	27	83	590
19	70	121	219	13	97	520	58	193	230	29	86	596
20	35	60	246	17	64	422	55	252	289	16	67	679
21	83	125	283	22	73	586	71	260	321	35	68	755
22	31	268	124	37	57	517	11	222	103	38	89	463
24	31	30	94	20	32	207**	11	119	191	23	12	356
25	241	34	199	23	61	558	236	145	143	21	25	570
26	96	96	228	22	44	491	61	133	337	23	36	590
27	106	101	406	34	61	508	91	259	108	53	41	552
28	56	140	142	39	100	477	51	231	352	30	105	769
29	71	147	438	33	111	800	56	89	301	24	78	548
31	31	22	248	23	27	331**	51	72	103	18	-13	231**

SEPTEMBER 1964

Date	Morning Peak - MW					Evening Peak - MW					
	TEC	FPC	FPL	OUC	Subtotal	TEC	FPC	FPL	OUC	Subtotal
1	51	29	237	16	333	66	106	219	18	409
2	86	60	271	21	438	66	139	194	28	427
3	96	59	232	18	405	71	179	153	20	423
4	66	71	198	20	355	56	194	228	17	495
5	76	133	299	37	545	91	139	184	40	455
N 7	131	252	497	58	938	66	137	334	46	583
8	126	128	341	23	618	16	65	248	22	351
9	61	264	517	68	910	126	247	332	39	744
10	121	249	409	46	825	51	229	155	34	469
11	86	220	247	37	590	81	172	207	32	492
12	56	218	403	29	706	96	202	303	25	626
14	96	252	477	40	865	41	115	205	30	391
15	91	213	389	33	726	81	173	328	31	613
16	106	192	500	27	825	211	218	232	30	691
17	221	214	297	42	774	146	84	24	27	281
18	206	179	455	37	877	161	89	191	26	467
19	101	19	441	22	583	56	2	307	24	389
21	76	116	373	37	604	56	66	231	15	368
22	120	173	514	32	839	30	95	267	15	407
23	121	154	493	29	797	36	65	181	31	313
24	51	88	294	33	466	46	9	118	21	194
25	76	61	339	31	507	61	40	222	27	350
26	11	72	276	19	378	71	-28	133	24	200
28	38	68	237	27	370	-5	9	117	21	142
29	84	104	271	25	484	35	-56	142	13	134
30	74	85	248	23	430	50	-18	101	13	146

* Not included in total, because unavailable to pool due to line clearance on FPL system

** Total spinning reserve less than capability of pool's largest unit — 300 mw, April thru August 28; 425 mw, August 29 thru September

N = Holiday

KSB
10/26/64
Table 2
Attachment 2

DAYS ACTUAL SPINNING RESERVE WAS LESS THAN
80% OF SPINNING RESERVE OBLIGATION*
JUNE - AUGUST 1964 (Sundays & Holidays Omitted)

	TEC	FPC	FPL	OUC	JAX	
MORNING PEAK -						
June (26 days)	4	10	11	0	11	
July (26 days)	0	9	1	1	4	
August (26 days)	5	6	1	4	1	
June-Aug. (78 days)	9	25	13	5	16	
EVENING PEAK -						
June	8	8	3	2	12	
July	1	4	1	0	2	
August	5	0	2	3	4	
June-Aug.	14	12	6	5	18	
* Obligations:						
June 1 - Aug. 28	54	66	121	21	38	(300 TOTAL)
Aug. 29 - Aug. 31	71	88	189	27	50	(425 TOTAL)

Hearing Exhibit No. 3 (947)

BEST AVAILABLE COPY

Attachment 3
M 19-64

CONTACTS FOR EMERGENCY ASSISTANCE - EQUIPMENT SPARES

Tampa Electric Company

1. Lester Ulm, Jr., Director, Engineering
   Tampa Electric Company
   P. O. Box 111
   Tampa 1, Florida
   Business Phone: 876-4111
   Residence Phone: 835-3781

2. Elmer Geiger, General Superintendent, Operations
   (Same address)
   Business Phone: 876-4111
   Residence Phone: 877-2944

Florida Power Corporation

1. Lee H. Scott, Asst. Superintendent,
   Transmission and Distribution
   Florida Power Corporation
   P. O. Box 14042
   St. Petersburg, Florida 33733
   Business Phone: 898-2141
   Ext. 5241
   Residence Phone: 867-6756
   (if no answer
   call Dispatcher: 862-3636)

Florida Power & Light Company

1. H. V. Street, Chief Engineer
   Florida Power & Light Company
   P. O. Box 3100
   Miami, Florida 33101
   Business Phone: FR 4-5333
   Ext. 265
   Residence Phone: FR 1-2124

2. E. L. Bivans, Assistant Chief Engineer
   (Same address)
   Business Phone: FR 4-5333
   Ext. 378
   Residence Phone: EM 1-2869

3. J. A. Lasseter, Assistant Chief Engineer
   (Same address).
   Business Phone: FR 4-5333
   Ext. 5113
   Residence Phone: MU 1-0424

Orlando Utilities Commission

1. Irving Reedy, Director of Power Transmission
   Orlando Utilities Commission
   P. O. Box 3193
   Orlando, Florida
   Business Phone: CH 1-4411
   Home Phone: CY 3-2426

2. Henry Elliott, Chief Communications Technician
   (Same address)
   Business Phone: CH 1-4411
   Residence Phone: 855-8872

3. Ray Turner, Chief, Substation Maintenance
   (Same address)
   Business Phone: CH 1-4411
   Home Phone: 277-3849

City of Jacksonville

1. R. B. Cowan, Engineer Manager
   Electric & Water Utilities
   City of Jacksonville
   220 East Bay Street
   Jacksonville, Florida
   Business Phone: EL 5-0411
   Ext. 308
   Home Phone: EV 9-4157

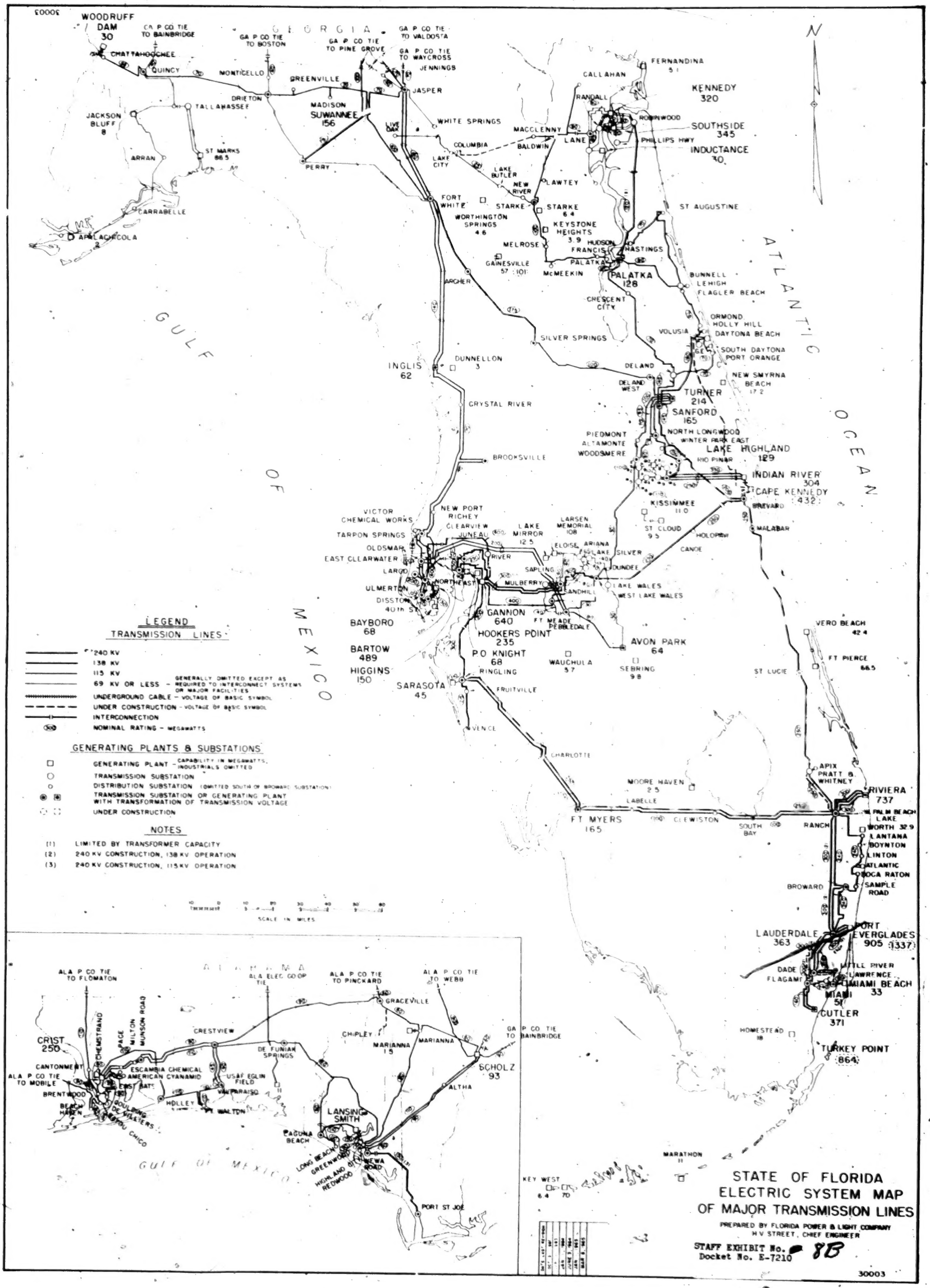
2. R. L. McCall, Superintendent, System Operations
   3065 Randall Street
   Jacksonville, Florida
   Business Phone: EV 8-5541
   EL 5-0411
   Ext. 643
   Home Phone: 359-1573

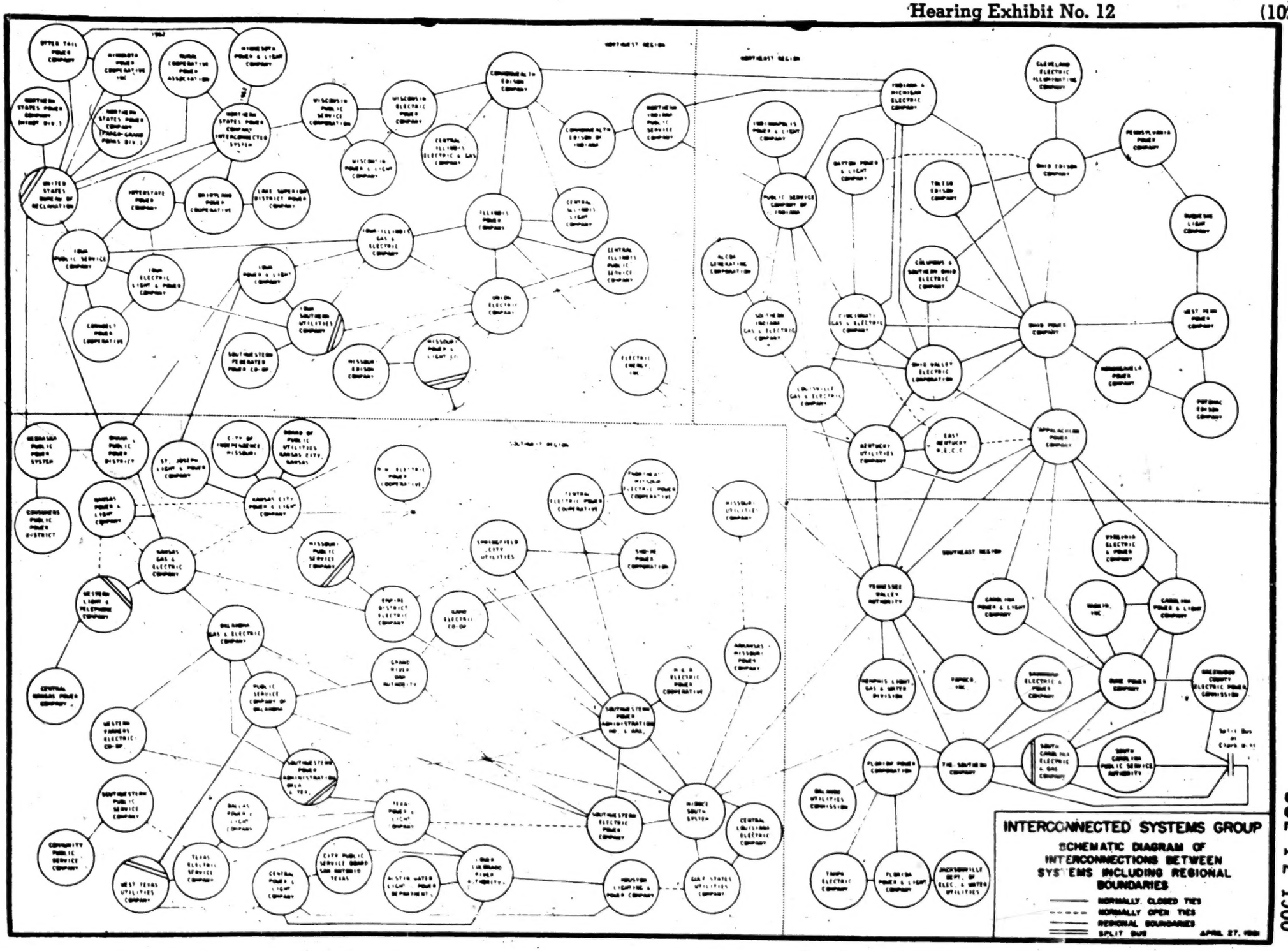
3. T. W. Bostwick, Manager, Power Production
   220 East Bay Street
   Jacksonville, Florida
   Business Phone: EL 5-0411
   Ext. 343
   Home Phone: RA 4-6307

Electric Energy Transfers Between
Florida Power & Light Company And Other Electric Utility Systems In Florida
During Calendar Year 1964

Transferred From	Transferred To	Amount Transferred (Kilowatt-hours)
Electric Utility System	Electric Utility System	
Florida Power & Light Company	Florida Power Corporation	107,642,000
Florida Power Corporation	Florida Power & Light Company	61,598,000
Florida Power & Light Company	Tampa Electric Company	43,081,000
Tampa Electric Company	Florida Power & Light Company	59,404,000
Florida Power & Light Company	City of Jacksonville	17,268,000
City of Jacksonville	Florida Power & Light Company	18,181,000
Florida Power & Light Company	Orlando Utilities Commission	21,431,000
Orlando Utilities Commission	Florida Power & Light Company	59,876,000

STAFF EXHIBIT No. 4
Docket No. E-7210


WOODRUFF DAM 30
GEORGIA
CA P CO TIE TO BAINBRIDGE
CHATTAHOOCHEE
QUINCY
GA P CO TIE TO BOSTON
MONTICELLO
GREENVILLE
GA P CO TIE TO PINE GROVE
GA P CO TIE TO VALDOSTA
GA P CO TIE TO WAYCROSS
JENNINGS
JASPER
DRIETON
TALLAHASSEE
MADISON
SUWANNEE 156
JACKSON BLUFF 8
WHITE SPRINGS
LIVE OAK
COLUMBIA
LAKE CITY
PERRY
ARRAN
ST MARKS 86.5
CARRABELLE
APALACHICOLA 2
FORT WHITE
WORTHINGTON SPRINGS 46
LAKE BUTLER
NEW RIVER
STARKE
STARKE 64
LAWTEY
MACCLENNY
BALDWIN
LANE
CALLAHAN
FERNANDINA 51
KENNEDY 320
RANDALL
ROSEWOOD
SOUTHSIDE 345
PHILLIPS HWY
INDUCTANCE 30.
ST AUGUSTINE
KEYSTONE HEIGHTS 39
MELROSE
HUDSON
FRANCIS
HASTINGS
GAINESVILLE 57 : 101
PALATKA
McMEEKIN
PALATKA 128
BUNNELL
LEHIGH
FLAGLER BEACH
ARCHER
CRESCENT CITY
ORMOND
HOLLY HILL
DAYTONA BEACH
VOLUSIA
SILVER SPRINGS
SOUTH DAYTONA
PORT ORANGE
INGLIS 62
DUNNELLON 3
DELAND
DELAND WEST
NEW SMYRNA BEACH 17.2
TURNER 214
SANFORD 165
CRYSTAL RIVER
PIEDMONT
ALTAMONTE
WOODSMERE
NORTH LONGWOOD
WINTER PARK EAST
LAKE HIGHLAND 129
RIO PINAR
INDIAN RIVER 304
CAPE KENNEDY (432)
BROOKSVILLE
KISSIMMEE 110
BREVARD
VICTOR CHEMICAL WORKS
NEW PORT RICHEY
CLEARVIEW
JUNEAU
LAKE MIRROR 12.5
LARSEN MEMORIAL 108
ST CLOUD 95
HOLOPAW
MALABAR
TARPON SPRINGS
OLDSMAR
EAST CLEARWATER
ELOISE
ARIANA
LAKE SILVER
CANOE
RIVER
LARGO
SAPLING
DUNDEE
NORTHEAST
MULBERRY
LAKE WALES
WEST LAKE WALES
ULMERTON
SANDHILL
DISSTON
40th ST
GANNON 640
FT MEADE
PEBBLEDALE
BAYBORO 68
HOOKERS POINT 235
AVON PARK 64
BARTOW 489
P O KNIGHT 68
WAUCHULA 57
SEBRING 98
HIGGINS 150
RINGLING
SARASOTA 45
FRUITVILLE
VERO BEACH 42.4
FT PIERCE 66.5
ST LUCIE
VENICE
CHARLOTTE
APIX PRATT & WHITNEY
MOORE HAVEN 25
RIVIERA 737
LABELLE
FT MYERS 165
CLEWISTON
SOUTH BAY
RANCH
PALM BEACH LAKE WORTH 32.9
LANTANA
BOYNTON
LINTON
ATLANTIC
BOCA RATON
SAMPLE ROAD
BROWARD
LAUDERDALE 363
PORT EVERGLADES 905 (1337)
DADE
FLAGAMI
LITTLE RIVER
LAWRENCE
MIAMI BEACH 33
MIAMI 51
CUTLER 371
HOMESTEAD
TURKEY POINT (864)
MARATHON
KEY WEST 64 70
GULF OF MEXICO
ATLANTIC OCEAN
N
LEGEND
TRANSMISSION LINES
240 KV
138 KV
115 KV
69 KV OR LESS – GENERALLY OMITTED EXCEPT AS REQUIRED TO INTERCONNECT SYSTEMS OR MAJOR FACILITIES
UNDERGROUND CABLE – VOLTAGE OF BASIC SYMBOL
UNDER CONSTRUCTION – VOLTAGE OF BASIC SYMBOL
INTERCONNECTION
NOMINAL RATING – MEGAWATTS
GENERATING PLANTS & SUBSTATIONS
GENERATING PLANT – CAPABILITY IN MEGAWATTS, INDUSTRIALS OMITTED
TRANSMISSION SUBSTATION
DISTRIBUTION SUBSTATION (OMITTED SOUTH OF BROWARD SUBSTATION)
TRANSMISSION SUBSTATION OR GENERATING PLANT WITH TRANSFORMATION OF TRANSMISSION VOLTAGE
UNDER CONSTRUCTION
NOTES
(1) LIMITED BY TRANSFORMER CAPACITY
(2) 240 KV CONSTRUCTION, 138 KV OPERATION
(3) 240 KV CONSTRUCTION, 115 KV OPERATION
SCALE IN MILES
ALABAMA
ALA P CO TIE TO FLOMATON
ALA ELEC CO-OP TIE
ALA P CO TIE TO PINCKARD
ALA P CO TIE TO WEBB
GRACEVILLE
CHEMSTRAND
PAGE MILTON
MUNSON ROAD
CRESTVIEW
CHIPLEY
MARIANNA 15
MARIANNA
GA P CO TIE TO BAINBRIDGE
CRIST 250
DE FUNIAK SPRINGS
SCHOLZ 93
CANTONMENT
ESCAMBIA CHEMICAL
AMERICAN CYANAMID
USAF EGLIN FIELD
ALA P CO TIE TO MOBILE
BRENT WOOD
BEACH HAVEN
HOLLEY
WALTON
ALTHA
LANSING SMITH
PACUNA BEACH
LONG BEACH
GREENWOOD
HIGHLAND OF REDWOOD
NEWA ROAD
PORT ST JOE
GULF OF MEXICO
STATE OF FLORIDA
ELECTRIC SYSTEM MAP
OF MAJOR TRANSMISSION LINES
PREPARED BY FLORIDA POWER & LIGHT COMPANY
H V STREET, CHIEF ENGINEER
STAFF EXHIBIT No. 8B
Docket No. E-7210
30003



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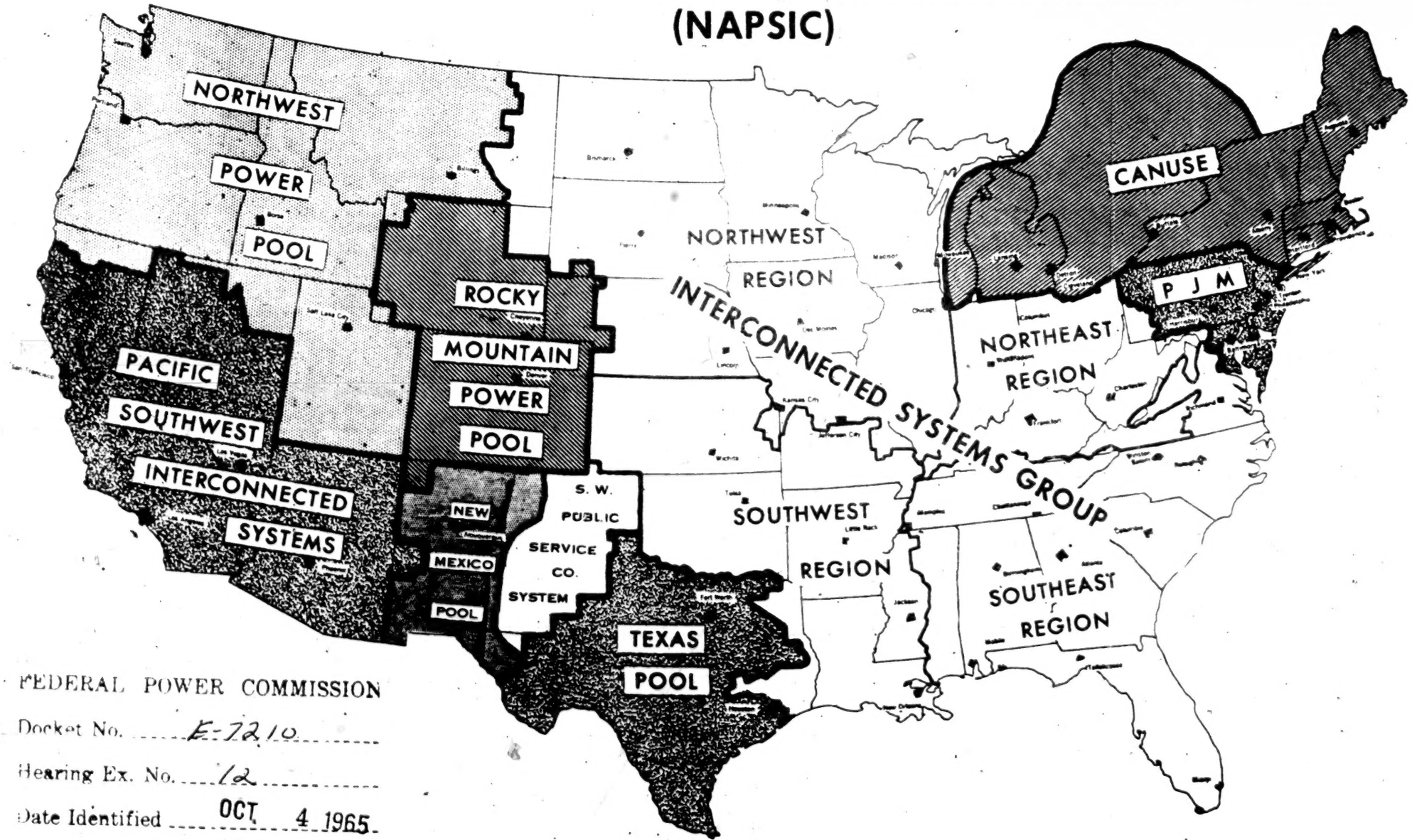
COOL 12 1966

STAFF EXHIBIT No. 13
Docket No. E-7210
187

MAJOR INTERCONNECTED POWER SYSTEMS

North American Power Systems Interconnection COMMITTEE (NAPSIC)



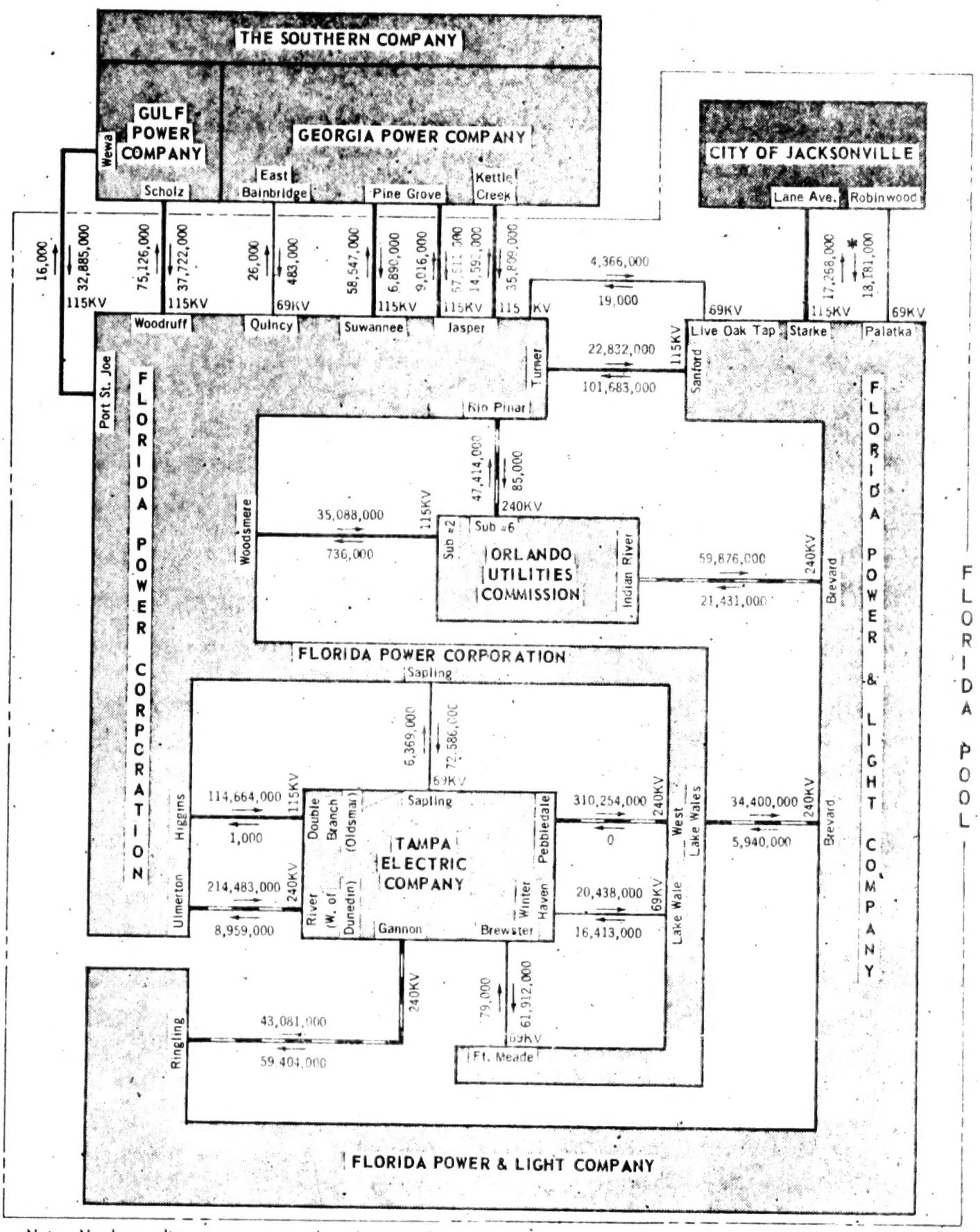
FEDERAL POWER COMMISSION
Docket No. E-7210
Hearing Ex. No. 12
Date Identified OCT 4 1965
Date Admitted OCT 4 1965

STAFF EXHIBIT No. 12
Docket No. E-7210

CERTIFIED COPY
JUL 12 1966

THE INTERCONNECTIONS WITHIN THE FLORIDA POOL AND ALSO BETWEEN THE SOUTHERN COMPANY AND FLORIDA POWER CORPORATION AND THE ENERGY TRANSFERS OVER THESE INTERCONNECTIONS

DATA OBTAINED FROM FPC FORMS NO. 12



Note: Numbers adjacent to arrows indicate magnitude of energy transfers in kilowatt-hours

*Net interchange of energy of the two lines

LEGEND

- DIRECTION OF ENERGY TRANSFER
- 69KV LINE
- 115KV LINE
- 240KV LINE

STAFF EXHIBIT NO. 15
Docket No. E-7210

BEST AVAILABLE COPY

Hearing Exhibit No. 15

Net Electric Energy Transfers Between The Electric Utility Systems Within The Florida Pool And Also The Interstate Energy Transfers Between The Southern Company And Florida Power Corporation
(Data obtained from FPC Forms No. 12 for 1964)

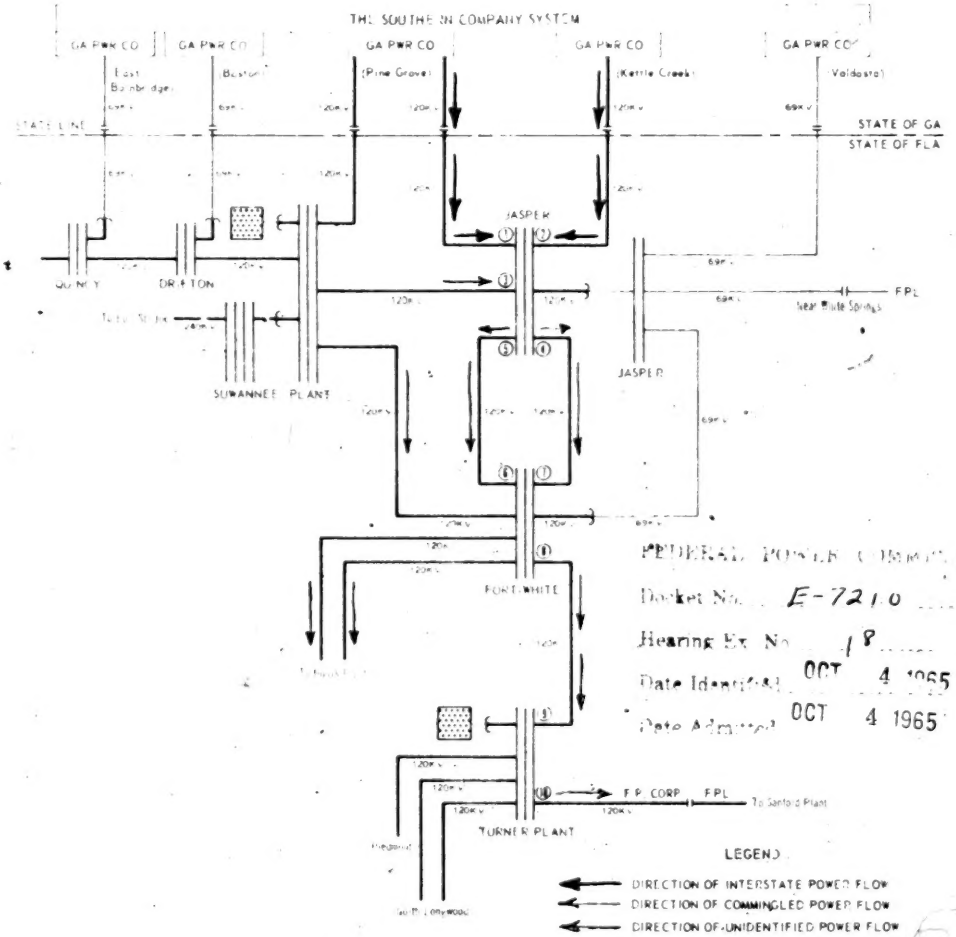
Transferred From	Transferred To	Amount Transferred
Electric Utility System	Electric Utility System	(Kilowatt-hours)
The Southern Company	Florida Power Corporation	167,476,000*
Florida Power Corporation	The Southern Company	157,324,000
Florida Power & Light Company	Florida Power Corporation	107,642,000
Florida Power Corporation	Florida Power & Light Company	61,598,000
Florida Power & Light Company	Tampa Electric Company	43,081,000
Tampa Electric Company	Florida Power & Light Company	59,404,000
Florida Power & Light Company	City of Jacksonville	17,268,000
City of Jacksonville	Florida Power & Light Company	18,181,000
Florida Power & Light Company	Orlando Utilities Commission	21,431,000
Orlando Utilities Commission	Florida Power & Light Company	59,876,000

*In addition there was 3,851,000 kilowatt-hours transferred from the Southeastern Power Administration to Florida Power Corporation across the Georgia-Florida State line over The Southern Company's transmission lines.

Hearing Exhibit No. 18

CERTIFIED COPY
JUL 12 1966

ROUTE OF INTERSTATE ELECTRIC POWER FLOW IN 1964 FROM GEORGIA POWER COMPANY TO FLORIDA POWER & LIGHT COMPANY SYSTEM OVER THE FLORIDA POWER CORPORATION TRANSMISSION LINES*



FEDERAL POWER COMMISSION
Docket No. E-7210
Hearing Ex. No. 18
Date Identified OCT 4 1965
Date Admitted OCT 4 1965

*For load conditions that existed for specified days and hours shown on the attached sheets

STAFF EXHIBIT No. 18
Docket No. E-7210

Hourly Interstate Power Flow On Selected Days In 1964
From Georgia Power Company To Florida Power & Light Company
Over Florida Power Corporation Transmission Lines
Shown On Load Flow Diagram On Page 1*

Note: + sign denotes power flow away from a substation bus.
- sign denotes power flow into a substation bus.

HOUR	JASPER SUBSTATION BUS						FORT WHITE SUBSTATION BUS			TURNER PLANT STATION BUS	
	INTERSTATE POWER FROM GA PWR CO (KW)			(KW)	(KW)	(KW)	(KW)	(KW)	(KW)	(KW)	COMMINGLED POWER TO FPL (KW)
	Point (1)	Point (2)	Total (1)+(2)	Point (3)	Point (4)	Point (5)	Point (6)	Point (7)	Point (8)	Point (9)	Point (10)
JUNE 23											
7A	-12,000	- 2,000	-14,000	-29,000	+15,000	+13,000	-11,000	-10,000	+38,000	- 7,000	+ 8,000
JUNE 25											
7A	- 9,000	- 3,000	-12,000	-23,000	+13,000	+11,000	-11,000	-10,000	+38,000	- 7,000	+15,000

HOUR	JASPER SUBSTATION BUS						FORT WHITE SUBSTATION BUS			TURNER PLANT STATION BUS	
	INTERSTATE POWER FROM GA PWR CO (KW)			(KW)	(KW)	(KW)	(KW)	(KW)	(KW)	(KW)	COMMINGLED POWER TO FPL (KW)
	Point (1)	Point (2)	Total (1)+(2)	Point (3)	Point (4)	Point (5)	Point (6)	Point (7)	Point (8)	Point (9)	Point (10)
JULY 2 7A	- 9,000	- 7,000	-16,000	-18,000	+13,000	+12,000	- 6,000	- 8,000	+26,000	- 3,000	+10,000
JULY 9 7A	-11,000	- 6,000	-17,000	-18,000	+14,000	+12,000	-12,000	-12,000	+34,000	- 3,000	+ 5,000
JULY 16 7A	- 4,000	+ 1,000	- 3,000	-18,000	+ 8,000	+ 4,000	- 6,000	- 6,000	+22,000	- 3,000	+ 8,000
JULY 17 7A	- 6,000	- 1,000	- 7,000	-19,000	+13,000	+ 5,000	-12,000	-15,000	+32,000	- 3,000	+12,000
JULY 20 7A	- 7,000	- 3,000	-10,000	-21,000	+13,000	+12,000	-14,000	-14,000	+36,000	- 7,000	+ 2,000

HOUR	JASPER SUBSTATION BUS						FORT WHITE SUBSTATION BUS			TURNER PLANT STATION BUS	
	INTERSTATE POWER FROM GA PWR CO (KW)			(KW)	(KW)	(KW)	(KW)	(KW)	(KW)	(KW)	COMMINGLED POWER TO FPL (KW)
	Point (1)	Point (2)	Total (1)+(2)	Point (3)	Point (4)	Point (5)	Point (6)	Point (7)	Point (8)	Point (9)	Point (10)
JULY 27											
7A	- 6,000	- 1,000	- 7,000	-16,000	+ 7,000	+ 8,000	- 6,000	- 8,000	+26,000	- 2,000	+12,000
JULY 28											
7A	-11,000	- 6,000	-17,000	-19,000	+14,000	+13,000	-13,000	-12,000	+31,000	- 2,000	+ 6,000
JULY 30											
7P	-14,000	-10,000	-24,000	No info	No info	No info	-20,000	-24,000	+52,000	- 3,000	+10,000
JULY 31											
6P	-10,000	- 9,000	-19,000	No info	No info	No info	-18,000	-20,000	+56,000	-10,000	+ 2,000
7P	-12,000	-11,000	-23,000	No info	No info	No info	-20,000	-20,000	+54,000	- 8,000	+10,000
8P	- 9,000	- 7,000	-16,000	No info	No info	No info	-16,000	-16,000	+50,000	- 4,000	+ 4,000

HOUR	JASPER SUBSTATION BUS						FORT WHITE SUBSTATION BUS			TURNER PLANT STATION BUS	
	INTERSTATE POWER FROM GA PWR CO (KW)			(KW)	(KW)	(KW)	(KW)	(KW)	(KW)	(KW)	COMMINGLED POWER TO FPL (KW)
	Point (1)	Point (2)	Total (1)+(2)	Point (3)	Point (4)	Point (5)	Point (6)	Point (7)	Point (8)	Point (9)	Point (10)
AUGUST 4 7A	- 9,000	- 4,000	-13,000	-24,000	+16,000	+ 9,000	-15,000	-14,000	+40,000	- 8,000	+ 2,000
AUGUST 7 7A	- 9,000	- 6,000	-15,000	-20,000	+15,000	+11,000	-14,000	-18,000	+36,000	- 6,000	+10,000
AUGUST 29 7A	-12,000	- 7,000	-19,000	-11,000	+11,000	+ 9,000	-14,000	-12,000	+30,000	- 7,000	+10,000
SEPTEMBER 16 7A	- 9,000	- 5,000	-14,000	-16,000	+12,000	+12,000	- 8,000	-10,000	+30,000	- 2,000	+15,000
SEPTEMBER 19 7A	-10,000	- 9,000	-19,000	-13,000	+14,000	+10,000	- 4,000	- 6,000	+20,000	- 1,000	+30,000

HOUR	JASPER SUBSTATION BUS						FORT WHITE SUBSTATION BUS			TURNER PLANT STATION BUS	
	INTERSTATE POWER FROM GA PWR CO (KW)			(KW)	(KW)	(KW)	(KW)	(KW)	(KW)	(KW)	COMMINGLED POWER TO FPL (KW)
	Point (1)	Point (2)	Total (1) + (2)	Point (3)	Point (4)	Point (5)	Point (6)	Point (7)	Point (8)	Point (9)	Point (10)
SEPTEMBER 21											
6P	-22,000	-18,000	-40,000	-20,000	+23,000	+21,000	-20,000	-24,000	+46,000	- 3,000	+12,000
8P	-24,000	-23,000	-47,000	-21,000	+28,000	+25,000	-26,000	-26,000	+54,000	- 4,000	+14,000
9P	- 7,000	- 7,000	-14,000	-11,000	+ 9,000	+ 8,000	-26,000	-24,000	+48,000	- 4,000	+24,000
SEPTEMBER 23											
7A	-16,000	- 6,000	-22,000	-20,000	+13,000	+14,000	-16,000	-14,000	+38,000	- 8,000	+ 4,000
SEPTEMBER 26											
7A	-11,000	- 7,000	-18,000	-13,000	+11,000	+12,000	- 9,000	-12,000	+26,000	- 2,000	+14,000
8A	- 7,000	+ 2,000	- 5,000	-13,000	+ 4,000	+ 6,000	- 8,000	- 6,000	+24,000	-10,000	+18,000
SEPTEMBER 28											
7A	- 9,000	- 6,000	-15,000	-28,000	+19,000	+15,000	-16,000	-14,000	+42,000	-10,000	+20,000
8A	-12,000	- 9,000	-21,000	-27,000	+20,000	+16,000	-16,000	-16,000	+46,000	- 2,000	+32,000
7P	-27,000	-24,000	-51,000	-30,000	+33,000	+27,000	-26,000	-29,000	+66,000	- 6,000	+50,000

	JASPER SUBSTATION BUS						FORT WHITE SUBSTAION BUS			TURNER PLANT STATION BUS	
	INTERSTATE POWER FROM GA PWR CO (KW)			(KW)	(KW)	(KW)	(KW)	(KW)	(KW)	(KW)	COMMINGLED POWER TO FPL (KW)
	Point (1)	Point (2)	Total (1)+(2)	Point (3)	Point (4)	Point (5)	Point (6)	Point (7)	Point (8)	Point (9)	Point (10)
SEPTEMBER 30											
6P	-30,000	-26,000	-56,000	-28,000	+35,000	+28,000	-21,000	-24,000	+50,000	- 7,000	+45,000
7	-31,000	-25,000	-56,000	-32,000	+37,000	+29,000	-28,000	-30,000	+70,000	- 4,000	+55,000
8	-29,000	-27,000	-56,000	-25,000	+32,000	+28,000	-28,000	-32,000	+68,000	- 2,000	+40,000
9	-17,000	-15,000	-32,000	-26,000	+24,000	+18,000	-25,000	-23,000	+54,000	- 4,000	+50,000
OCTOBER 1											
6P	-30,000	-27,000	-57,000	-21,000	+32,000	+24,000	-24,000	-27,000	+56,000	- 3,000	+38,000
8P	-25,000	-26,000	-51,000	-18,000	+28,000	+24,000	-23,000	-25,000	+50,000	- 2,000	+43,000

(1054)

FEDERAL POWER COMMISSION
Docket No. E-7210
Hearing Ex. No. 19
Date Identified OCT 4 1965
Date Admitted OCT 4 1965

CERTIFIED COPY
JUL 12 1966

Hearing Exhibit No. 19

Hourly Interstate Power Flow On Selected Days In 1964
From Georgia Power Company To Florida Power & Light Company
Over Florida Power Corporation Transmission Lines
Shown On Load Diagram On Page 1 Of Staff Exhibit 18

Note: + sign denotes power flow away from a substation bus.
- sign denotes power flow into a substation bus.

Points ③, ④, ⑤, ⑥, ⑦ and ⑧ are not shown due to lack of information.

HOUR	JASPER SUBSTATION BUS			TURNER PLANT STATION BUS	
	INTERSTATE POWER FROM GA PWR CO (KW)			(KW)	COMMINGLED POWER TO FPL (KW)
	Point ①	Point ②	Total ① + ②	Point ⑨	Point ⑩
JUNE 23					
2A	- 6,000	- 2,000	- 8,000	- 7,000	+20,000
3	- 6,000	- 2,000	- 8,000	- 6,000	+20,000
4	- 8,000	- 1,000	- 9,000	- 8,000	+24,000
5	- 8,000	- 4,000	-12,000	- 7,000	+21,000
6	- 9,000	- 1,000	-10,000	-10,000	+18,000
JUNE 25					
1A	-10,000	- 6,000	-16,000	- 8,000	+20,000
2	- 7,000	- 5,000	-12,000	- 7,000	+22,000
3	- 9,000	- 5,000	-14,000	- 7,000	+24,000
4	- 9,000	- 6,000	-15,000	-10,000	+26,000
5	- 9,000	- 4,000	-13,000	- 6,000	+25,000
6	-10,000	- 5,000	-15,000	- 5,000	+24,000
JULY 2					
1A	- 8,000	- 4,000	-12,000	- 4,000	+20,000
2	- 9,000	- 7,000	-16,000	- 8,000	+18,000
3	- 8,000	- 6,000	-14,000	- 5,000	+12,000
4	- 8,000	- 7,000	-15,000	- 7,000	+14,000
5	-12,000	-11,000	-23,000	- 7,000	+18,000
6	-10,000	- 6,000	-16,000	- 4,000	+18,000

STAFF EXHIBIT No. 19
Docket No. E-7210

HOUR	JASPER SUBSTATION BUS			TURNER PLANT STATION BUS	
	INTERSTATE POWER FROM GA PWR CO (KW)				COMMINGLED POWER TO FPL (KW)
	Point (1)	Point (2)	Total (1) + (2)	Point (9)	Point (10)
JULY 9					
1A	- 8,000	- 7,000	-15,000	- 2,000	+ 2,000
2	- 8,000	- 8,000	-16,000	- 4,000	+12,000
3	-11,000	- 8,000	-19,000	- 5,000	+12,000
4	-11,000	- 8,000	-19,000	- 7,000	+10,000
5	-12,000	-10,000	-22,000	- 5,000	+12,000
6	-12,000	- 7,000	-19,000	- 5,000	+12,000
JULY 16					
2A	- 8,000	- 4,000	-12,000	- 2,000	+18,000
3	- 7,000	- 9,000	-16,000	- 3,000	+23,000
4	- 9,000	- 5,000	-14,000	- 2,000	+22,000
5	-11,000	- 5,000	-16,000	- 3,000	+23,000
6	- 4,000	+ 2,000	- 2,000	- 5,000	+18,000
JULY 17					
1A	-16,000	-13,000	-29,000	-10,000	+24,000
2	-12,000	- 9,000	-21,000	- 8,000	+26,000
3	-11,000	- 6,000	-17,000	- 7,000	+24,000
4	- 9,000	- 5,000	-14,000	- 8,000	+16,000
5	-11,000	- 5,000	-16,000	- 7,000	+18,000
6	-10,000	- 4,000	-14,000	- 5,000	+14,000
JULY 20					
3A	- 8,000	- 6,000	-14,000	- 2,000	+10,000
4	- 7,000	- 7,000	-14,000	- 2,000	+10,000
5	- 8,000	- 7,000	-15,000	- 4,000	+15,000
6	- 7,000	- 2,000	- 9,000	- 4,000	+10,000

HOUR	JASPER SUBSTATION BUS			TURNER PLANT STATION BUS	
	INTERSTATE POWER FROM GA PWR CO (KW)			(KW)	COMMINGLED POWER TO FPL (KW)
	Point (1)	Point (2)	Total (1) + (2)	Point (9)	Point (10)
JULY 27					
1A	- 7,000	- 7,000	-14,000	- 5,000	+ 6,000
2	- 8,000	- 5,000	-13,000	- 3,000	+10,000
4	- 7,000	- 4,000	-11,000	- 2,000	+10,000
5	- 6,000	- 6,000	-12,000	- 2,000	+10,000
6	- 7,000	- 6,000	-13,000	- 3,000	+10,000
JULY 28					
3A	- 6,000	- 4,000	-10,000	- 3,000	+ 6,000
4	- 9,000	- 8,000	-17,000	- 3,000	+ 8,000
5	-10,000	- 9,000	-19,000	- 3,000	+ 8,000
6	- 9,000	- 3,000	-12,000	- 2,000	+ 8,000
JULY 30					
2A	-10,000	- 6,000	-16,000	- 2,000	+ 2,000
4	- 8,000	- 6,000	-14,000	- 3,000	+ 3,000
6	- 9,000	- 5,000	-14,000	- 3,000	+ 2,000
JULY 31					
2A	-10,000	- 4,000	-14,000	- 5,000	+10,000
3	- 8,000	- 8,000	-16,000	- 5,000	+10,000
5	- 5,000	- 6,000	-11,000	- 5,000	+ 4,000
6	-12,000	- 7,000	-19,000	-10,000	+10,000
AUGUST 4					
1A	- 9,000	- 7,000	-16,000	- 2,000	+ 2,000
2	-12,000	-11,000	-23,000	-10,000	+ 1,000

HOUR	JASPER SUBSTATION BUS			TURNER PLANT STATION BUS	
	INTERSTATE POWER FROM GA PWR CO (KW)			(KW)	COMMINGLED POWER TO FPL (KW)
	Point (1)	Point (2)	Total (1) + (2)	Point (9)	Point (10)
AUGUST 7					
1A	-11,000	- 7,000	-18,000	- 5,000	+10,000
2	- 9,000	- 4,000	-13,000	- 6,000	+12,000
3	-13,000	-10,000	-23,000	-12,000	+12,000
4	- 9,000	- 6,000	-15,000	-10,000	+12,000
5	- 2,000	0	- 2,000	- 5,000	+ 8,000
6	- 9,000	- 4,000	-13,000	- 5,000	+ 8,000
AUGUST 29					
2A	- 9,000	- 9,000	-18,000	- 4,000	+16,000
4	- 9,000	- 9,000	-18,000	- 2,000	+ 8,000
5	- 8,000	- 9,000	-17,000	- 3,000	+ 6,000
6	-14,000	-13,000	-27,000	- 3,000	+ 8,000
SEPTEMBER 16					
1A	- 8,000	- 5,000	-13,000	- 3,000	+14,000
3	-10,000	- 7,000	-17,000	- 2,000	+14,000
4	- 8,000	- 5,000	-13,000	- 2,000	+14,000
SEPTEMBER 21					
1A	- 7,000	- 7,000	-14,000	- 3,000	+20,000
2	-10,000	-10,000	-20,000	- 5,000	+18,000
3	-13,000	- 9,000	-22,000	- 8,000	+20,000
4	-12,000	- 5,000	-17,000	- 8,000	+20,000
5	-14,000	- 5,000	-19,000	- 8,000	+20,000
SEPTEMBER 23					
1A	- 6,000	- 6,000	-12,000	- 3,000	+ 4,000
2	-11,000	- 7,000	-18,000	- 5,000	+10,000
3	-12,000	- 9,000	-21,000	- 8,000	+12,000
4	-15,000	- 9,000	-24,000	-10,000	+16,000
5	-11,000	- 6,000	-17,000	-10,000	+18,000

HOUR	JASPER SUBSTATION BUS			TURNER PLANT STATION BUS	
	INTERSTATE POWER FROM GA PWR CO (KW)			(KW)	COMMINGLED POWER TO FPL (KW)
	Point (1)	Point (2)	Total (1)+(2)	Point (9)	Point (10)
SEPTEMBER 26					
3A	- 7,000	- 3,000	-10,000	- 5,000	+ 8,000
4	- 8,000	- 5,000	-13,000	- 5,000	+ 5,000
5	-12,000	-10,000	-22,000	-10,000	+10,000
6	-10,000	- 9,000	-19,000	-10,000	+10,000
SEPTEMBER 28					
1A	- 6,000	- 3,000	- 9,000	- 7,000	+10,000
2	-11,000	- 8,000	-19,000	- 9,000	+15,000
3	-10,000	- 8,000	-18,000	- 8,000	+15,000
4	- 7,000	- 4,000	-11,000	- 8,000	+16,000
5	- 8,000	- 5,000	-13,000	- 6,000	+16,000
6	-10,000	- 5,000	-15,000	- 6,000	+15,000
OCTOBER 1					
3A	- 4,000	- 2,000	- 6,000	- 3,000	+12,000
4	- 4,000	- 2,000	- 6,000	- 2,000	+12,000
5	- 6,000	- 2,000	- 8,000	- 3,000	+12,000

Florida Power & Light Company
SYSTEM DISPATCHER'S INTERCHANGE LOG

FILED JUN 29 1964

HOUR ENDING	DELIVERED: FLORIDA POWER CORP SN	LD	BREV'D	TEC	OUC	SCHED PURCH	RECEIVED: FLORIDA POWER CORP SN	LD	BREV'D	TEC	OUC	SCHED SALES	POOL INADVERT. THIS HOUR	POOL INADVERT. ACCUMULATED BALANCE ON PK	OFF PK	JACKSONVILLE DEL SCHED PURCH	REC	SCHED SALES	JACKSONVILLE INADVERTENT THIS HOUR	ON PK	OFF PK	SYS NET INADVERT. THIS HOUR	REGULATING ERROR: INADVERTENT CORRECTION IN	OUT	NET TIME ERROR F	S	ADJUSTED TIME ERROR F	S	FREQUENCY BIASING OF SCHED. IN	OUT	REG. ERROR IN MWH IN	OUT	MISC. INT'CH'G SETTER IN	OUT	HOUR ENDING
	* ADD THESE FIGURES						SUBTRACT THESE FIGURES							+144	+9	SUBTRACT				-10	-4		ADD	SUB											
1A			9				5			4			0		+9		1		-1		-5	-1			0				0	1.0		1.0		1A
2			11				7			2			+2		+11		1		-1		-6	+1			0				0		1.0	1.0		2
3			12				9			1			+2		+13		2		-2		-8	-4			0				0	4.0		4.0		3
4			15				13			2			0		+13				0		-8	0			.1				.5		.5	1.0		4
5			14				13			1			0		+13				0		-8	0			.2				1.0		1.0	1.0		5
6			13				12			2			-2		+11		1		+1		-7	-1			.1				.5		.5	1.0		6
7			15				10			1			-2		+9		1				-6	-1			.2				1.0		0	3.0	103	7
8			21				8			12			-11		-10		1		0		-6	+1			.6				3.0					8
9			12				4			13			-5	139			1					-4			.2				1.5					9
10	20		9				15			15			-4	135			2		+2			-2			.2				1.0					10
11	20		11				20			15			-4	131			1					-3			.8		.9		.5					11
12N	21		14				20			12			-12	133								+1			.2		.8		3.0					12N
1P	15		16				20			15			-4	129			1					-1			3.0		1.6		1.0					1P
2	15		16				20			14			-3	126			2					-1			.1				.5					2
3	13		18				20			12			-1	125			0		0			-1			.1				.5		.5			3
4	14		19				20			12			+1	126			1					+1			.4				2.0		0			4
5	13		19				20			11			+1	127					1			-1			.3				1.5		1.5			5
6	11		23				19			11			+4	131					1			+3			.3				1.5		1.5			6
7	12		15				18			10			-1	130			1					0			.2				1.0		1.0			7
8	12		17				18			13			+2	128			0		0			-2			.3				1.5		2.5			8
9	11		21				19			12			+16	144			0					+16			.5				2.5					9
10	1		24				11			5			+5	149			2		+2		-2	+7			0				0		7.0	20	125	10
11			18				9			10			-1		+9				1		-7	-2			.4				2.0		0			11
12N		8	14				6			6	8		+2		+11		1		+1		-6	+3			.2				1.0		4.0	2.0		12N
TOTAL OFF PK	0	28	142				93	0		47	8		-46		+11		4		6		-6													
TOTAL ON PK	178	0	234				15	217		175	0			+149			11		3		-2													
TOTAL	178	28	376				108	217		222	8			+160			15		9		-8													

	TODAY'S	MONTH'S TOTAL
SCHED SALES		
SCHED PURCH		

TODAY'S SCHED PURCH
MONTH'S TOTAL SCHED PURCH

TODAY'S SCHED SALES
MONTH'S TOTAL SCHED SALES

TODAY'S PURCH
MONTH'S PURCH

TIME CORRECTIONS AND PARTICIPATION: 1/2 Station use of ... 10-7P T.D. Ends ... 4:42P T.D. = 1 Station ... 7:57P TO 8:17: 1 Sec = Low.

REMARKS AND SCHEDULES: 9 Sec Separated from 7 Sec. at Live Oak Sep-

LIVE OAK	
IN	OUT
7615	7201
7398	6982
217	8

STAFF EXHIBIT No. 26
Docket No. E-7210

DISPATCHER

11 P.M. - 7 A.M.

7 A.M. - 3 P.M.

3 P.M. - 11 P.M.

FORM 770 REV. 4/63

1226 5287 Anderson

Florida Power & Light Company
SYSTEM DISPATCHES INTERCHANGE LOG

FRI JUL 3 1964

HOUR ENDING	DELIVERED: FLORIDA POWER CORP. SN	LO	BREV'D	TEC	OUC	SCHED PURCH	RECEIVED: FLORIDA POWER CORP. SN	LO	BREV'D	TEC	OUC	SCHED SALES	POOL INADVERT. THIS HOUR	ACCUMULATED BALANCE ON PK	OFF PK	JACKSONVILLE DEL	SCHED PURCH	REC.	SCHED SALES	INADVERTENT THIS HOUR	ON PK	OFF PK	REGULATING ERROR SYS. NET INADVERT. THIS HOUR	INADVERTENT CORRECTION IN	OUT	NET TIME ERROR F	S	ADJUSTED TIME ERROR F	S	FREQUENCY BIASING OF SCHED. IN	OUT	REG. ERROR IN MWH IN	OUT	MISC. INT'CH'G SETTER IN	OUT	HOUR ENDING
	ADD THESE FIGURES						SUBTRACT THESE FIGURES							+69	+26	ADD		SUBTRACT			-18	+20		ADD	SUB											
1A	4			7							6		+5		+31	2				+2		+22	+7			0				0			7.0	1.0		12
2	8			2			1				6		+5		+36			3		-3		+19	+2			.6				3.0	1.0		1.0		2
3	7									1	7		-1		+35			4		-4		+15	-5			.5				2.5	2.5		1.0		3
4	7			2							6		+3		+38			2		-2		+11	-1			.1				.5	1.5		1.0		4
5	5			3							4		+3		+41			3		-3		+8	0			0				0	0		2.5		5
6	5			1							5		+1		+44			2		-2		+6	-1			0				0	1.0		2.5		6
7	12									4	7		+1		+43	1		3		-2		+4				0.1									7
8	12			7				3		1	7		+8		+51					0		+4											50	N/A	8
9	8			16				15			14		-5	+46												LIVE OAK NOT RECORDING							3.0		9
10	8			13				16			15		-10	+50												JAX. NOT METERING									10
11	12			16				17			15		-4	+50		18		187																	11
12N	16			14				18			14		-2	+48		5		50	0							0.2				1.0					12N
1P	11			19				14			14		-2	+46		5		50	0																	1P
2	5			20				15			15		-5	+41												0									2
3	4			23				16			15		-4	+37		10		100	0				-4			.2				1.0	3.0		6.0		3
4	7			21				15			14		-1	+36									-1			0				0	1.0		6.0		4
5	14			14				15			14		-1	+35		10		100	0				-1			.1				.5	.5		6.0		5
6	14			13				16			12		-1	+34									-1			.2				1.0	0		6.0		6
7	14			10				15			13		-4	+30		10		100	0				-4			.2				1.0	3.0		0	6.0	7
8	17			9				15			12		-1	+29		10		100	0				-1			.1				.5	.5		6.0	7.5	8
9	16			13				16			11		+2	+31		10		100	0				+2			0				0	2.0		0	8.5	9
10	13			8				14	220		9		-2	+33		5		50	0				-2			.1				.5	1.5		0		10
11	20							13		3	7		-3		+48	5		50	0			+4	-3			.2				1.0	2.0		0		11
12M	20							4		8	8		0		+48	8		8	0			+4	0			.2				1.0		1.0	2.0		12M
TOTAL OFF PK	100			23			1	20		17	63		+22		+22	61	19	58	-16			-16													
TOTAL ON PK	159			209				217			187		-40	-40		73		737	0																
TOTAL	259			232			1	237		17	250		-18			798	19	795	-16																

TODAY'S SCHED SALES		TODAY'S SCHED PURCH		TODAY'S SCHED SALES		TODAY PURCH	
MONTH'S TOTAL SCHED SALES		MONTH'S TOTAL SCHED PURCH		MONTH'S TOTAL SCHED SALES		MONTH PURCH	

TIME CORRECTIONS AND PARTICIPATION

T.O. #3 1 Slo @ 811A: JAX ADV: FPL NOT PART'G - RYAN MATR = 1.5 Slo & CORRECTED.

REMARKS AND SCHEDULES 700A DEL 50 MW/3M TO JAX START NOW -
11:00P Jax requested O'Brien 110M - 3/hr
11:21P Clewiston-Lakeland requested to 2 up.

740A Closed. Jasper op'd STANTON: DEL AT SNB REC'D AT L.O.

DISPATCHER W. P. C. 11 P.M. - 7 A.M. | MONROE 7 A.M. - 3 P.M. | 3 P.M. - 11 P.M.

FORM 770 REV. 6/63

Florida Power & Light Company
SYSTEM DISPATCHRS INTERCHANGE LOG

MON JUL 20 1964

HOUR ENDING	DELIVERED: FLORIDA POWER CORP. SN	LO	BREV'D	TEC	OUC	SCHED PURCH	RECEIVED: FLORIDA POWER CORP. SN	LO	BREV'D	TEC	OUC	SCHED SALES	POOL INADVERT. THIS HOUR	ACCUMULATED BALANCE ON PK +122	OFF PK +59	JACKSONVILLE DEI	SCHED PURCH	REC.	SCHED SALES	INADVERTENT THIS HOUR	ON PK -27	OFF PK -7	REGULATING ERROR: SYS. NET INADVERT. THIS HOUR	INADVERTENT CORRECTION IN ADD	OUT SUB	NET TIME ERROR F	S	ADJUSTED TIME ERROR F	S	FREQUENCY BIASING OF SCHED. IN	OUT	REG. ERROR IN MWH IN	OUT	MISC. INT'CH'G SETTER IN	OUT	HOUR ENDING
	ADD THESE FIGURES						SUBTRACT THESE FIGURES									DD		SUBTRACT			DD															
1A	2			6						8			0					1		-1		-8	-1							1.0		1.0	12½	1A
2	2			6						7			+2					1		0		-8	+2			0					20	1.0		2
3	1			4			1			7			-3		+58	0		0		0		-8	-3			.2				1.0	4.0		2.5.0		3
4				12			12			5			-3			1		0		0		-8	-3			0				0	5.0		0		4
5				10			10			4			-4		+49			0		0		-8	-4			0				0	1.0		1.0		5
6				16			14			1			+1		+50	1		1		0		-8	+1			0				0		1.0	2.0	12½	6
7				14			11			4			-1		+49			1		-1		-9	-2			.3				1.5	3.5		2.0		7
8	5			9						9			+5		+54	1				+1		-8	+6			.6				3.0		3.0	5.0	7.14	8
9	18			2					.2	12			+6	+188				2		-2	-29		+4			1.0				5.0	1.0		5.0		9
10	21								7	13			+1	+189						0	-29		+1			.4				2.0	1.0		5.0		10
11	17			1					3	13			+2	+191		2				+2	-27		+4			.2				1.0		3.0	5.0		11
12N	17								7	12			-2	+189		2				+2	-25		0		.3		.6		3.0	3.0		2.0	11.05	12N
1P	19								11	13			-5	+184		2				+3	-22		-2		1.5		.3		1.5	3.5		2.0		1P
2	23								12	13			-3	+181		3				+3	-19		0		1.8		0		0		0	2.0		2
3	18								13	12			-7	+174		4				+4	-15		-3							3.0		2.0		3
4	17								11	13			-7	+167		2				+2	-13		-5								5.0		2.0		4
5	8								6	12			-10	+157		8		8		0	-13		-10		3				1.5		8.5		2.0		5
6				14			6			11			-3	+154		2		20		0	-13		-3		3				1.5		.5		2.0		6
7				16			4			10			+2	+156		10		19		0	-13		+2			.2			1.0		1.0		2.0		7
8				22			8			10			+4	+160		14		19		0	+13		+4			.4			2.0		2.0		2.0		8
9				22			5			11			+6	+166		18		18		0	-13		+6			.5			2.5		3.5		2.0		9
10				14		7	8	3		12			-1	+152		12		19		0	-13		-1			0			0		1.0		9.26	2.0	10
11				7		14	2	14		9			-5		+49	2		21		0		-8	-4		3				1.5		2.5			2.0	11
12M	5			7		12	2	12		7			+2		+51	4				+4		-4	+6		.2				1.0		7.0		11.52.0		12M
TOTAL OFF PK	15			91		26	53	26		0	61				+51	28		4	21			-4														
TOTAL ON PK	157			96		3	31	3		72	167				+165	112		2	103			-13														
TOTAL	172			187		29	84	29		72	228					140		6	124																	

TODAY'S SCHED SALES	TODAY'S SCHED PURCH	TODAY'S SCHED SALES
MONTH'S TOTAL SCHED SALES	MONTH'S TOTAL SCHED PURCH	MONTH'S TOTAL SCHED SALES

TODAY PURCH	
MONTH PURCH	

REMARKS AND SCHEDULES 2.42P 6 Lks = 20 MW, Start 11.45P
10.29P " " 0 " " 11.00P

TIME CORRECTIONS AND PARTICIPATION 3.25A 3.35A ave 3.496
T.48A. T.O. 19 = 1" slow @ 7.30A. No corr. Got advised.
11.12A. " Neavills 194 = 3" slow @ 10.15A. Stats 60.03 NOK " "
1.52P. " " = .5" " " 1.30P. " " 60 " @ 2.00P. ADVISED JAY

IN OUT
9421 .7006
Line Cor 7.94 - 7006
29

FORM 770 REV. 4/63

DISPATCHER 11 P.M.-7 A.M. 7 A.M.-3 P.M. 3 P.M.-11 P.M.

Florida Power & Light Company
SYSTEM DISPATCHER'S INTERCHANGE LOG

~~SAT FEB 8 1964~~ RT AUG 7 1964

HOUR ENDING	DELIVERED: FLORIDA POWER CORP. SN	LO	BREV'D	TEC	OUC	SCHED PURCH	RECEIVED: FLORIDA POWER CORP. SN	LO	BREV'D	TEC	OUC	SCHED SALES	POOL INADVERT. THIS HOUR	ACCUMULATED BALANCE ON PK	ACCUMULATED BALANCE OFF PK	JACKSONVILLE DEL	SCHED PURCH	REC.	SCHED SALES	INADVERTENT THIS HOUR	INADVERTENT ON PK	INADVERTENT OFF PK	SYS. NET INADVERT. THIS HOUR	INADVERTENT CORRECTION IN	INADVERTENT CORRECTION OUT	NET TIME ERROR	ADJUSTED TIME ERROR	FREQUENCY BIASING OF SCHED. IN	FREQUENCY BIASING OF SCHED. OUT	REG. ERROR IN MWH IN	REG. ERROR IN MWH OUT	MISC. INT'CH'G SETTER IN	MISC. INT'CH'G SETTER OUT	HOUR ENDING
	ADD THESE FIGURES						SUBTRACT THESE FIGURES							+17	+3	D		SUBTRACT			-2	-1		ADD	SUB	F	S	F	S						
1A				17			6			6			0		+3	0		0		0		-1	0			0			0		0		1.0		1A
2				16			17			4			0		+3	3				+17		+1	+17			.1			1.5		2.5		1.0		2
3				17			11			7			-1		+17	1				+1		+2	0			.3			1.5		2.0			3
4				8			10			7			-4		-7	1				+1		+3	-3			1.7			1.0		2.0		0	4
5				8			9			3			-6		-6	2				+17		+1	-17			0			0		2.0		0	5
6				8			7			3			-2		-8	1				+1		+6	-1			.2			1.0		0		2.0	6
7				12			10			5			-3		-11	1				+1		+7	-2			0			0		20		2.0		7
8	5			10			1			10			+4		-7	1		1		0		+7	+4			0.7			3.5		0.5		4.0	706	8
9	9			6						8			+7	+19				1		-1	-3		+6			0.7			3.0		3.0		4.0		9
10	12									9		4	-1	+18		1				+1	-2		0			0.2			1.0	1.0			2.0	906	10
11	18									9		8	+1	+19		0		0		0	-2		+1			0.2			1.0	0			3.0	1005	11
12N	24									10		16	0	+19		1		1		0	-2		0			0.2			1.0	1.0			3.0		12N
1P	30									10		16	+4	+23		1				+1	-1		+3			0.2			1.0		2.0		4.0	12/1P	1P
2	32									11		24	-1	+22		0				0	-1		-1			0			0	1.0			2.0	1/10P	2
3	30									11		20	-1	+21						0	-1		-1			.2			1.0		0		3.0	2/15P	3
4	31									11		18	+2	+23						0	-1		-2			.2			1.0	1.0			3.0		4
5	28									15		12	+1	+24						0	-1		+1			.1			.5		1.5		3.0		5
6	19									16		2	+1	+25		2				+2	+1		+3			.2			1.0		4.0		3.0		6
7	19									16		4	-1	+24						0	+1		-1			0			0	1.0			0	602	7
8	20									16		3	+1	+25				2		-2	-1		-1			.3			1.5	2.5			4.0	704	8
9	18									17			+1	+26						0	-1		+1			0			0		1.0		4.0		9
10	24									20		7	-3	+23		1		1		0	-1		-3			0			0	3.0	RE 9		2.0	903	10
11	29									21		11	-3		-10	2				+7		+9	-1			.3			1.5		.5		2.0		11
12M	30									18		14	-2		-12	1				+1		+10	-1			.3			1.5		.5		2.0		12N
TOTAL OFF PK	64			86			66			25	74		-15		-15	12		1		+11		+11													
TOTAL ON PK	318			6						134	179		+11	+11		6		5		+1	+1													
TOTAL	382			92			66			159	253		-4			18		6		+12														

TODAY'S SCHED SALES	TODAY'S SCHED PURCH	TODAY'S SCHED SALES	TODAY PURCH
MONTH'S TOTAL SCHED SALES	MONTH'S TOTAL SCHED PURCH	MONTH'S TOTAL SCHED SALES	MONTH PURCH

TIME CORRECTIONS AND PARTICIPATION B/W #6 & #7 = 1 sec slow.
325-335A Corr Freq. 60.003 ~

REMARKS AND SCHEDULES Under Id

FORM 770 REV. 4/63

DISPATCHER 11 P.M. - 7 A.M. Mowe 7 A.M. - 3 P.M. 3 P.M. - 11 P.M.

Florida Power & Light Company
SYSTEM DISPATCHES INTERCHANGE LOG

MON AUG 31 1964

HOUR ENDING	DELIVERED: FLORIDA POWER CORP. SN	LO	BREV'D	TEC	OUC	SCHED PURCH	RECEIVED: FLORIDA POWER CORP. SN	LO	BREV'D	TEC	OUC	SCHED SALES	POOL INADVERT. THIS HOUR	POOL INADVERT. ACCUMULATED BALANCE ON PK	OFF PK	DEL	JACKSONVILLE SCHED PURCH	REC.	SCHED SALES	INADVERTENT THIS HOUR	INADVERTENT ON PK	INADVERTENT OFF PK	REGULATING ERROR: SYS. NET INADVERT. THIS HOUR	INADVERTENT CORRECTION IN ADD	INADVERTENT CORRECTION OUT SUB	NET TIME ERROR F	NET TIME ERROR S	ADJUSTED TIME ERROR F	ADJUSTED TIME ERROR S	FREQUENCY BIASING OF SCHED. IN	FREQUENCY BIASING OF SCHED. OUT	REG. ERROR IN MWH IN	REG. ERROR IN MWH OUT	MISC. INT'CH'G SETTER IN	MISC. INT'CH'G SETTER OUT	HOUR ENDING
	ADD THESE FIGURES						SUBTRACT THESE FIGURES										SUBTRACT					+31	-32														
1A	9			14					12		3		+8		+34	1				+1		-2	+9				.4				2.0		7.0	12.0	0	1A
2	4			12					11		2		+3		+37			1		-1		-3	+2				.4				2.0	0		10.5	4.0	2
3	3			14					9		3		+8		+42					0		-3	+8				.2				1.0		4.0		4.0	3
4	1			9					9		3		-2		+40	1				+1		-2	-1				.4				2.0	3.0		3.05	7.0	4
5	3			8					9		3		-1		+39	1				+1		-1	0				.3				1.5	1.5		4.10	3.0	5
6	8			5					15		2		-4		+35	1				+1		0	-3				0				0	3.0		3.0	8.05	6
7	17			4					19		2		0		+33	1				+1		+1	+1				.4				2.0		1.0	6.0	6.05	7
8	5			27	6		6		32				0		+25	22		22		0		+1	0				.2				1.0	1.0		6.0		8
9	2			29	5		2		33				+1		-146	18		18		0		+31	+1				.2				1.0			6.0		9
10	7			32	6	10	2	10	40				+3		-143	26		26		0		+31	+3				.6				3.0			6.0		10
11	9			32	8	23		23	49				0		-143	35		35		0		+31	0				.1				.5	.5		6.0		11
12N	6			32	9	25		25	48				+1		-142	36		35		0		+31	+1				.0				.0		1.0	6.0		12N
1P	2			25	6	24	1	24	41				+1		-141	36		36		0		+31	+1				.3				1.5		.5	6.0		1P
2	8			32	7	25		25	46				+1		-140	26		26		0		+31	+1				.2				1.0		.0	6.0		2
3	8			27	6	25		25	44				-3		-143	26		24		0		+31	-3				.5				.5	.5		6.0		3
4	10			26	6	24		24	45				-3		-146	24		24		0		+31	-3				.1				.5	3.5		8.0	2.05	4
5	7			30	6	23		23	46				-3		-149	26		26		0		+31	-3				.2				1.0	2.0		10.0	12.0	5
6	5			34	7	19		19	45				+1		-148	26		25		0		+31	+1				.5				2.0		3.5	13.0	5.05	6
7	3			40	4	18	2	18	38				+7		-141	26		25		0		+31	+7				.2				1.0		8.0	13.0		7
8				48	4	22	18	22	40				-6		-147	31		31		0		+31	-6				.2				1.0	5.0		10.0	7.05	8
9				37	6	21	4	21	38				+1		-146	26		26		0		+31	+1				.5				2.5		3.5	10.0		9
10	10			23	5				37				+1		-145	19		19		0		+31	+1				.5				2.5		3.5	8.0	1.05	10
11	9			10	2				26		1		-6		+29	2				+2		+3	-4	5.0		.6				3.0		4.0	4.0	12.05	11
12N	8			8					14		3		-1		+22					0		+3	-1	5.0		.1			.5	1.5		2.0	11.15		12N
TOTAL OFF PK	67			111	8	0	6	0	156		22				+11	20		1	22																		
TOTAL ON PK	77			459	85	259	29	259	590		0				-236	378		0	378																		
TOTAL	144			570	93	259	35	259	746		22				-147	400		1	400																		

SYSTEM MON AUG 31 1964

TODAY'S SCHED SALES	TODAY'S SCHED PURCH	TODAY'S SCHED SALES	TODAY PURCH
MONTH'S TOTAL SCHED SALES	MONTH'S TOTAL SCHED PURCH	MONTH'S TOTAL SCHED SALES	MONTH PURCH

REMARKS AND SCHEDULES 7:10A Jax Requests 30.0 MW from FPL. Granted on Unit #2
8:00A " " 15.0 " " "
9:00A " " 20.0 " " "
7" " " " " "
9" SPS " " the Credit from Unit #2 "
1:40P " " " 75.0 MW

LIVE OAK	
IN	OUT
0446	7002
0187	7002
259	

7:07P Jax req 35 MW more. 9:30P Jax req 0 MW
7:20 Jax req 30 " " 9:51P P&L req 2 MW
7:55P Jax req 25 " " from 9 P.C.

DISPATCHER

11 P.M. - 7 A.M. | 7 A.M. - 3 P.M. | 3 P.M. - 11 P.M.

TIME CORRECTIONS AND PARTICIPATION A 10A. Average 3:20-3:35 A = 59.995.
A 10A. T.O. 38 = On time @ 3:10 A. .2" fast @ 3:00 A. JAX ADVISED.
2:00 P T.O # 39 = O.T. at 7:22 P.
8:39P T.O # 40 = Line fast at 7:22 P.
10:05P 5 mw in on T.O # 40

FORM 770 REV. 4/63

BEST AVAILABLE COPY

Florida Power & Light Company
SYSTEM DISPATCHES INTERCHANGE LOG

THU SEP 10 1964

HOUR ENDING	DELIVERED: FLORIDA POWER CORP. SN	LO	BREV'D	TEC	OUC	SCHED PURCH	RECEIVED: FLORIDA POWER CORP. SN	LO	BREV'D	TEC	OUC	SCHED SALES	POOL INADVERT. THIS HOUR	ACCUMULATED BALANCE ON PK	OFF PK	DEL	JACKSONVILLE SCHED PURCH	REC.	SCHED SALES	INADVERTENT THIS HOUR	ON PK	OFF PK	SYS. NET INADVERT. THIS HOUR	INADVERTENT CORRECTION IN ADD	OUT SUB	REGULATING ERROR: NET TIME ERROR F	S	ADJUSTED TIME ERROR F	S	FREQUENCY BIASING OF SCHED. IN	OUT	REG. ERROR IN MWH IN	OUT	MISC. INT'CH'G SETTER IN	OUT	HOUR ENDING
	ADD THESE FIGURES						SUBTRACT THESE FIGURES									DD	SUBTRACT																				
1A	19	12			6		6			25	5		+1		-14	TE	BAR CARIBBEAN						+1								1.0		3.0		1A
2	18	14			5		5			22	7		+3		-11	TE	JAX.						+3								1.0		3.0		2
3	16	16			3		3			19	8		+7		-4								+7								1.0		3.0		3
4	18	17			5		5			19	10		+6		-1								+6								3.0		3.0		4
5	16	16	1		6		6			17	9		+7		+1					0			+1								1.5	1.5		0	5
6	15	13	1		11		11			14	15		+12		+21					9			+12								9.5		9.5	0	6
7	27	3			8		8	1		20	3		+6		+27								+6								4.0		4.0	6.0	7
8	27		3		6		6	8		17	13		+5		+32					6			+8								6.0		6.0	4.0	8
9	16		5		7		7	13		10	15		-2		+31					19			-2								4.0		4.0	8.0	9
10	10		6		9		9	15		1	15		0		+31					19			0								3.0		3.0	0	10
11	31				10		10	8		16	7		0		+31	TE	A buys at Jax			19			0								0		0	0	11
12N	30				7		7	4		28	13		+5		+36			F		19			+4			.2		.9		3.5		.5	0	12N
1P	46				9		9	6		27	12		+1		+37			L		21			0			1.8		1.8		0		0	0	1P
2	45				9		9	3		27	14		+1		+38	2				19			+3			2.8		1.8		0		3.0	0	2
3	40				10		10	6		26	10		-2		+36					19			-2			.8		.1		.5		2.5	2.0	3
4	34				9		9	13		23	7		-9		+27	2				17			-7			.1				.5		7.5	2.0	4
5	42				9		9	13		18	10		+1		+28	2				15			+3			0				0		3.0	7.0	5
6	37		1		9		9	16		19	3		0		+28	3				12			+3			0				0		3.0	4.0	6
7	38		2		10		10	23		19	1		-3		+25	3				9			0			.1				.5	.5		3.0	7
8	47				8		8	26		19	5		-3		+22	2				7			-1			.5				2.5	3.5		3.0	8
9	41				9		9	17		22	5		-3		+19					7			-3			.6		3.0		3.5	0		3.0	9
10	35							15		20	1		-1		+18	6				1			+5			.7		3.5			8.5		3.0	10
11	21		1					12		18	2		-10		+32	6				1			-6			.2				1.5	4.5		0	11
12M	18							9		13	1		-5		+17	2				0			-3			.2		10		2.0			3.0	12M
TOTAL OFF PK	197	91	6	50			50	30		184	48				+17	1				0															
TOTAL ON PK	512	0	14	115			115	178		275	88				+18	26				1															
TOTAL	709	91	20	165			165	208		459	136					26				1															

TODAY'S SCHED SALES
MONTH'S TOTAL SCHED SALES

TODAY'S SCHED PURCH
MONTH'S TOTAL SCHED PURCH

TODAY'S SCHED SALES
MONTH'S TOTAL SCHED SALES

TODAY PURCH
MONTH PURCH

REMARKS AND SCHEDULES

909 P " " 0 MW from F.P.C. now.

TIME CORRECTIONS AND PARTICIPATION

6:30A " " on time = 6:52A

7:39A T.O. #18 = 1" slow at 6:39A.

11:20A Cancel T.O. #18 at 10:42A go to 60.0 on T.O.'s

2:20P T.O. "C" = 1" slow at 2:40P go to 60.00 at 2:

2:21P " 19 = 1" fast @ 3:00P. Go to adjust.

8:25P " " = On time 6:38P.

11:35P T.O. #20 = 1" fast at 8:54P.

DISPATCHER

7 A.M. - 3 P.M.

3 P.M. - 11 P.M.

FORM 770 REV. 6/63

BEST AVAILABLE COPY

Florida Power & Light Company
SYSTEM DISPATCHES INTERCHANGE LOG

SAT SEP 2 0 1984

HOUR ENDING	DELIVERED: FLORIDA POWER CORP SN	LO	BREV'D	TEC	OUC	SCHED PURCH	RECEIVED: FLORIDA POWER CORP SN	LO	BREV'D	TEC	OUC	SCHED SALES	POOL INADVERT. THIS HOUR	ACCUMULATED BALANCE ON PK	OFF PK	JACKSONVILLE DEL	SCHED PURCH	REC.	SCHED SALES	INADVERTENT THIS HOUR	ON PK	OFF PK	REGULATING ERROR: SYS NET INADVERT. THIS HOUR	INADVERTENT CORRECTION IN ADD	OUT SUB	NET TIME ERROR F	S	ADJUSTED TIME ERROR F	S	FREQUENCY BIASING OF SCHED. IN	OUT	REG. ERROR IN MWH IN	OUT	MISC. INT'CH'G SETTER IN	OUT	HOUR ENDING
	ADD THESE FIGURES						SUBTRACT THESE FIGURES							-123	+1			SUBTRACT			+17	+9														
1A				12	3		5	9					+1		+2			2		-2		+7	-1													1A
2				13	1		6	7					+1		+3	0		0		0		+7	+1													2
3				12	1		5	5			1		+2		+5			2		-2		+5	+1													3
4				13			10	2			1		0		-5			1		-1		+4	-1													4
5				13			9	2			1		-1		+6			2		-2		+2	-1													5
6				12	2		11	4			0		-3		+3			1		-1		+1	-4													6
7				14	4		12	6					0		+3			1		-1		0	-1													7
8				20	4		20	6					-2		+1			1		-1		-1	-3													8
9				24	6		19	5					+6	-117		1				+1		+18	+7	8	0					0		1.0		8.0	802	9
10				26	5		22	2					+7	-110		1				+1		+19	+8	8	.4					2.0				8.0		10
11			1	30	4		26						+9	-101						0		+19	+9	8	.6					4.0				8.0		11
12N			1	27	6		27	3					+4	-97		1				+1		+20	+5	8	.5					.5				5.0	1103	12N
1P				24	5		27	2					0	-97						0		+20	0		.3					1.5		1.5		5.0		1P
2			1	22	3		26	1					-1	-98				2		-2		+18	-3		.3					1.5		1.5		4.0	1110	2
3			2	19	1		25						-3	-101		U						2	-3		0.4					2.0		1.0		4.0		3
4			1	18	5		20	1					+3	-98		0		2		-2		+16	+1		0					0		1.0		5.0	1310P	4
5			1	17	7		21	1					+3	-95				2		-2		+14	+1				0.2			1.0		.0		4.0	1410P	5
6				19	11		23	4					+3	-92		0		2		-2		+12	+1				0.1			0.5		0.5		4.0		6
7				20	14		29	11					0	-92				2		-2		+10	-2				0.2			1.0	3.0			7.0	PM PM	7
8				34	15		33	12					+4	-88				1		-1		+9	+3		0.2									5.0		8
9				24	10		23	11					0	-88				1		-1		+8	-1		0.2				1.0		0			5.0		9
10				17	8		10	15					0	-88				2		-2		+6	-2		0				0		2.0			5.0		10
11				12	11		4	16					+3		+4			2		-2		-3	+3		.3				1.5			4.5		6.0	1112P	11
12N				9	11		1	16					+3		+7	0		0		0		-3	+3			.1				.5		2.5		4.0	1115P	12N
TOTAL OFF PK			0	150	35		83	73			3				+7	C		12				-3														
TOTAL ON PK			7	327	100		331	68			0			-88		3		14				+6														
TOTAL			7	457	135		414	141			3					3		26																		

TODAY'S SCHED SALES	TODAY'S SCHED PURCH	TODAY'S SCHED SALES	TODAY PURCH
MONTH'S TOTAL SCHED SALES	MONTH'S TOTAL SCHED PURCH	MONTH'S TOTAL SCHED SALES	MONTH PURCH

REMARKS AND SCHEDULES

TIME CORRECTIONS AND PARTICIPATION 8-7 T.O.#42=1 Sec Fast 240 fm - Jax Net
7-3P T.O.#40=0.T.
7-4P A.T.=1" slow @ 7-39A. Clock adjusted
8-0A 8 MW OUT To Balance. 0MW @ 12-02 N.
11-38A T.O.41 = On time @ 11-39A. Clock adjusted
2-45P T.O.#42 = 1 Sec Fast 240 fm - Jax Net

DISPATCHER

11 P.M. - 7 A.M. 7 A.M. - 3 P.M. 3 P.M. - 11 P.M.

FORM 770 REV. 4/83

FLORIDA POWER & LIGHT CO. SYSTEM DISPATCHERS INTERCHANGE LOG

DATE WED DEC 16 1964

HOUR ENDING	NET INTERCHANGE											SCHEDULED INTERCHANGE (EXCLUDES INADVERTENT CORRECTION)						INADVERTENT							REGULATING ERROR							HOUR ENDING
																		POOL			JACKSONVILLE			SYS NET	INADVERTENT CORRECTION	NET TIME ERROR	FREQ BIAS MSCH.	REGULATING ERROR		MISC INTERCHANGE SETTING		
	TEC	BREVD	SN	LVOBM	[illegible]	OUC	POOL	ROBINWOOD	LAKE	JAX	SYS.	TEC	FPC	OUC	POOL NET	AX	SYS NET	THIS HOUR	ACCUM BAL OFF PEAK	ACCUM BAL ON PEAK	THIS HOUR	ACCUM BAL OFF PEAK	ACCUM BAL ON PEAK	THIS HOUR		+ FAST - SLOW	- IN + OUT	IN -	OUT +	IN -	OUT +	
	1	2	3	4	5 (2+3+4)	6	7 (5+6)	8	9	10 (8+9)	11 (7+10 or Log)	12	13	14	15 (12+13+14)	16	17 (15+16)	18 (7-15)	19	20	21 10-10	22	23	24 (18+21) or (11-17)	25	26	27 (25+26)	28 (24-25-27)	29	30	31	
																		X	2	-16	X	16	0	BROUGHT FORWARD							
1A	-13	-15	10		-5	18	0			1	1							0	2		1	17		1		-.1	.8		.5	4.0		1A
2	-9	-12	5		-7	19	3			-1	2							3	5		-1	16		2		-.2	1.0		1.0	4.0		2
3	-10	-12	2		-10	20	0			-1	-1							0	5		-1	15		-1		-.2	1.0	2.0		4.0		3
4	-8	-12	0		-12	20	0			-1	-1							0	5		-1	14		-1		-.4	2.0	3.0		5.0	30	4
5	-7	-12	-1		-13	22	2			-1	1							2	7		-1	13		1		-.3	1.5	.5		5.0		5
6	-12	-18	4		-14	26	0			-1	-1							0	7		-1	12		-1		-.2	1.0	2.0		6.0	80	6
7	-12	-18	5		-13	27	2			-1	1							2	9		-1	11		1		-.3	+1.5	.5		8.0	60	7
8A	-21	-9	8		-1	23	1			0	1							1	10		0	11		1		-.3	+1.5	.5		8.0		8A
SUBTOT	-92	-108	33		-75	175	8			-5	3							8			-5			3								SUBTOT
9A	-22	-5	5		0	24	2			0	2							2		-14	0		0	2		+.1	-.5		2.5	8.0		9A
10P	-8	-13	2		-11	18	-1			2	1							-1		-15	2		2	1		+.2	-1.0		2.0	5.5	90	10
11P	0	-20	-3		-23	14	-9			1	-8							-9		-24	1		-3	-8		+.6	-3.0	-5.0		+.5	100	11
12N	0	-16	-3		-19	11	-8			2	-6							-8		-32	2		5	-6		+.7	-3.5	-2.5		+.5		12N
1P	-14	0	0		0	10	-4			1	-3							-4		-36	1		6			+.5	-2.5	-1.5		7.0	110	1P
2	-10	-3	3		0	12	2			-2	0							2		-34	-2		4	0		0	0	0		7.0		2
3	-10	-4	5		1	11	2			-1	1							2		-32	-1		3	1		0	0	1.0		7.0		3
4	-4	-5	1		-4	11	3			-1	2							3		-29	-1		2	3		0	0	3.0		7.0		4
5	-1	-10	1		-9	16	6			-2	4							6		-23	-2		0	4		-.6	+3.0	1.0		7.0		5
6	7	-2	13		11	7	25			-2	23			21	21			4		-19	-2		-2	2		-.6	+3.0	1.0		7.0		6
7	26	5	24		29	1	56			-1	55			50	50			6		-13	-1		-3	5		-.3	+1.5		3.5	5.0	60	7
8	22	7	22		29	2	53			-1	52			50	50			3		-10	-1		-4	2		-.3	+1.5		.5	3.0	70	8
9	-9	-6	16		10	4	5			-1	4			4	4			1		-9	-1		-5	0		-.4	+2.0	2.0		3.0		9
10P	-10	-9	10		1	10	1			0	1							1		-8	0		-5	1		0	0			5.0	90	10P
SUBTOT	-33				15	151	133			-5					125			2		8		—	-5									SUBTOT
11P	-9	-11	10		-1	14	4			0	4							4	14		0	11		4		0			4.0	5.0		11P
12MN	-2	-5	0		-5	9	2			1	3							2	16		1	12		3		+.2	-1.0		4.0	3.0	110	12MN
SUBTOT	-11	-16	10		-6	23				1																					SUBTOT
TOT OFF PK	-103	-124	43		-81	198				-4									16			12									TOT OFF PK
TOT ON PK	-33	-81	96		15	151				-5					125				-8			-5									TOT ON PK
TOT	136	-205	139		-66	349				-9					125																TOT

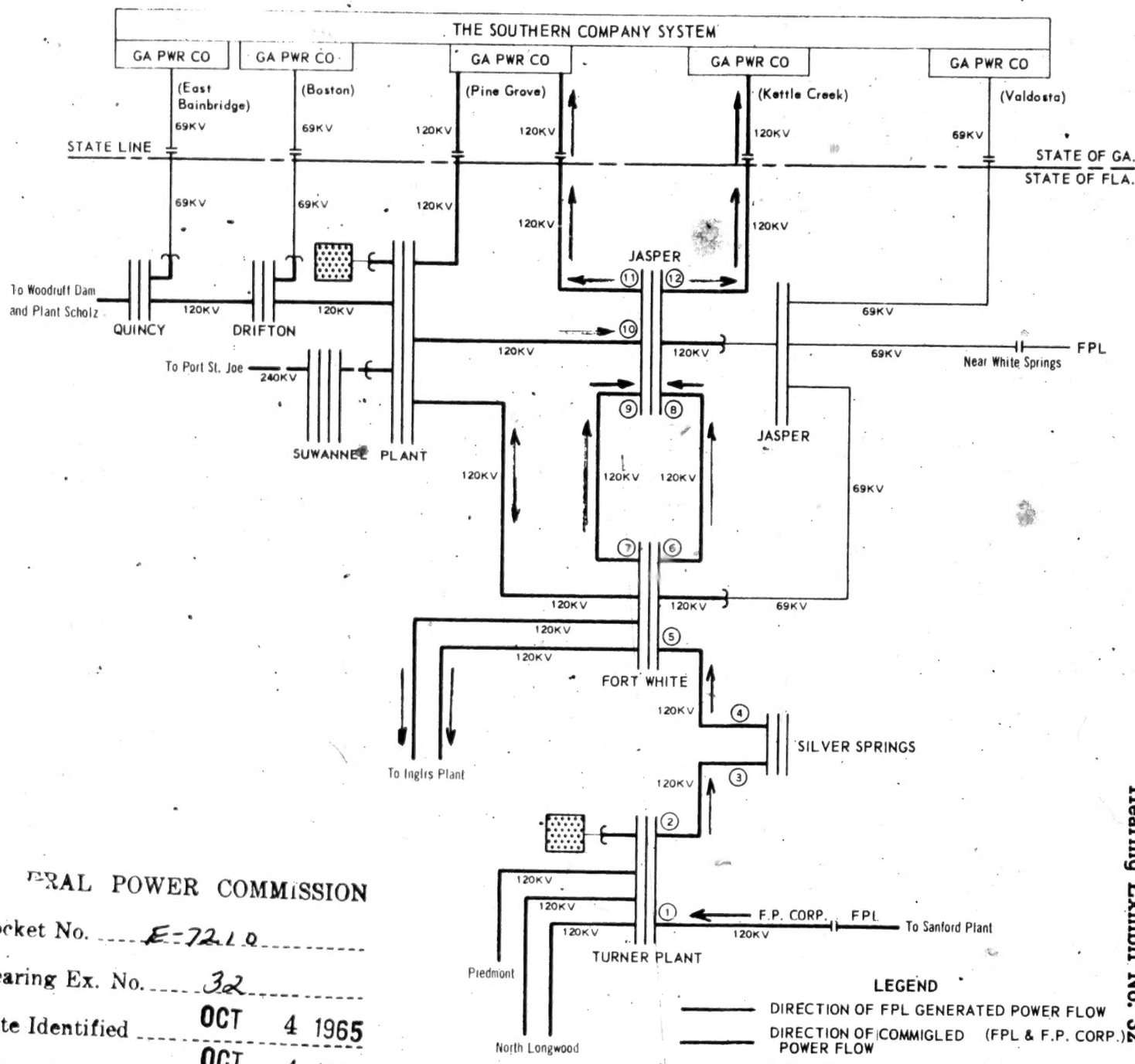
REMARKS AND SCHEDULES

TIME CORRECTIONS AND PARTICIPATION Grd. T.O. 19 = 1" fast.
5:36 A.T. 19 = On time @ 5:10 A. Also 3:25 3:35 average N = 59.997. Jax advised
12:15P T# 20 = 1 Sec FST, @ 11:55A = 6:23 P.T.O. # 20 5 of at 6:12 A

DISPATCHER
11P - 7A
7A - 3P
3P - 11P

CERTIFIED COPY
JUL 12 1966

ROUTE OF ELECTRIC POWER FLOW IN 1964 FROM
FLORIDA POWER & LIGHT COMPANY TO GEORGIA POWER COMPANY SYSTEM
OVER THE FLORIDA POWER CORPORATION TRANSMISSION LINES*



LEGEND

- DIRECTION OF FPL GENERATED POWER FLOW
- DIRECTION OF COMMIGLED (FPL & F.P. CORP.) POWER FLOW
- DIRECTION OF UNIDENTIFIED POWER FLOW
- 69KV, 120KV, 240KV
- INTERCONNECTION
- ① NUMBERS WITHIN CIRCLE ARE REFERENCE POINTS TO POWER FLOW AS SHOWN ON ATTACHED SHEETS
- GENERATING PLANT

* Actual load conditions that existed for specified days and hours as shown on the attached sheet.

FEDERAL POWER COMMISSION
Docket No. E-7210
Hearing Ex. No. 32
Date Identified OCT 4 1965
Date Admitted OCT 4 1965

211

Hearing Exhibit No. 32

STAFF EXHIBIT No. 32
Docket No. E-7210

(1115)

Hourly Power Flow On Selected Days in 1964
From Florida Power & Light Company To Georgia Power Company
Over Florida Power Corporation Transmission Lines
Shown On Load Flow Diagram On Page 1

Note - sign denotes power flow away from a substation bus.
- sign denotes power flow into a substation bus.

Day and Hour	Turner Plant		Silver Springs Substation Bus		Fort White Substation Bus			Jasper Substation Bus				
	Power From Florida Pwr. & Light Co.	(KW)	(KW)	(KW)	(KW)	East Curcuit KW	West Curcuit KW	East Curcuit KW	West Curcuit KW	(KW)	Commingled Power From FPL to Georgia Power Co.	Total Commingled Power To Georgia Pwr. Co. From FPL
											Pine Grove Curcuit / Kettle Creek Curcuit	
	Point (1)	Point(2)	Point(3)	Point(4)	Point(5)	Point(6)	Point(7)	Point(8)	Point(9)	Point(10)	Point (11)	Point (12) / Total (11) + (12)
July 8 11 A	-12,000	+38,000	-27,000	-11,000	- 2,000	+10,000	+11,000	- 7,000	- 7,000	-21,000	+21,000	+20,000 / +41,000
July 8 2 P	-18,000	+43,000	-37,000	+10,000	- 6,000	+11,000	+12,000	-10,000	- 8,000	-18,000	+21,000	+19,000 / +40,000
Aug. 12 11 A	-36,000	+48,000	-40,000	+14,000	- 8,000	+19,000	+16,000	-14,000	-12,000	-25,000	+16,000	+18,000 / +34,000
Aug. 12 12 A	-37,000	+49,000	-45,000	+20,000	- 3,000	+11,000	+11,000	-14,000	-12,000	-24,000	+20,000	+19,000 / +39,000
Aug. 17 10 A	-20,000	+45,000	-36,000	+11,000	- 6,000	+14,000	+10,000	-14,000	-12,000	-24,000	+18,000	+17,000 / +35,000

FLORIDA POWER CORPORATION

Silver Springs Substation Daily Operating Report
Fort White Substation Daily Operating Report
Jasper Substation Daily Operating Report
Turner Plant Daily Operating Report

STAFF EXHIBIT NO. 33
Docket No. E-7210

Hearing Exhibit No. 33

7-8-64 ~~7-1-64~~

FLORIDA POWER CORPORATION

SILVER SPRINGS SUBSTATION

DAILY OPERATING REPORT

DAY Wed DATE 7-8-64

TIME E.S.T.	BUS VOLTAGE		115 KV TRANSMISSION LINES						TRANSFORMER BANK				69 KV TRANSMISSION LINES															CAPACITOR BANK SW. 774			
			FORT WHITE SW. 111			TURNER SW. 291			BANK SW. 295				CITY OF OCALA SW. 695			CITY OF OCALA SW. 323			GAINESVILLE SW. 82			INGLIS SW. 61			LEESBURG SW. 297							
	115	69	AMPS	MW	MVAR	AMPS	MW	MVAR	AMPS	MW	MVAR	TAP	AMPS	MW	MVAR	AMPS	MW	MVAR	AMPS	MW	MVAR	AMPS	MW	MVAR	AMPS	MW	MVAR	AMPS			MVAR
1A		120								-12																					
2		"								-12																					
3		"								-11																					
4		"								-11																					
5		"								-11																					
6		119								-13																					
7		"								-14																					
8		"								-22																					
9	116	118	30	-16	+2	50	-7	-13	270	-23	-11	17	105	+10	+8	100	+11	+3	10	+2	-2	95	-11	+4	135	+10	+11	105	105	105	13
10	115	119	130	-24	+1	90	-16	-17	280	-24	-16	20	100	11	8	100	11	3	45	+6	0	100	-12	+3	140	+10	+12	"	"	"	"
11	114	118	50	-11	-6	140	-20	-10	350	-27	-16	21	115	11	8	100	11	3	85	+10	-3	95	-12	+4	130	+3	+14	"	"	"	"
12 N.	113	118	90	+20	-6	155	-28	-14	270	-28	-17	22	110	11	8	115	12	4	85	+10	-3	95	-13	+5	125	+5	+14	"	"	"	"
1P	113	118	25	0	-6	145	-27	-11	270	-27	-16	22	110	11	8	110	12	5	95	+11	-3	100	-12	+4	130	+3	+14	"	"	"	"
2	113	118	70	+10	-8	180	-37	-10	280	-27	-15	24	110	11	8	110	12	5	95	+11	-2	100	-12	+3	140	-2	+16	"	"	"	"
3	113	118	90	0	-7	160	-37	-13	260	-25	-18	24	115	11	9	115	12	5	50	+6	-2	105	-13	+4	140	+5	+15	"	"	"	"
4	112	118	90	+7	-7	135	-35	-13	260	-25	-18	24	115	11	9	125	12	5	50	+6	-2	105	-14	+5	145	+6	+15	"	"	"	"
5	112	118	90	+6	-7	135	-33	-13	270	-26	-19	24	120	12	9	125	13	5	50	+7	-2	105	-13	+4	145	+6	+15	"	"	"	"
6		119								-26																					
7		"								-23																					
8		118								-23																					
9		118								-22																					
10		119								-18																					
11		118								-18																					
12MN		119								-16																					

INTEGRATING METERS

CIRCUIT		METER READINGS PRES.	PREV.	DIFF.	CONST.	MWH OUTPUT TODAY	MONTH	MW DEMAND TODAY	MONTH	YEAR
TURNER 115KV SW291	-MWH	62403	62178	225	1000	225	1077	33	33	33
	+MWH	66978	66894	84	"	84	331	10	12	28
	-MVARH	44206	43882	324	"	324	2295	24	24	25
	+MVARH	18896	18840	0	"	0	0	0	0	9
FORT WHITE 115 KV SW. 111	-MWH	46347	45964	383	"	383	3410	33	31	50
	+MWH	01383	01371	12	"	12	22	3	8	8
	-MVARH	07883	07830	53	"	53	95	11	11	22
	+MVARH	78409	78301	108	"	108	938	10	12	19
115/69 KV BANK SW. 295	-MWH	92858	92357	501	"	501	4050	30	40	42
	+MWH	00002	00002	0	"	0	0	0	0	6
	-MVARH	48019	47769	250	"	250	1380	22	23	23
	+MVARH	27333	27333	0	"	0	60	0	6	15
CITY of OCALA 69KV SW.695	MWH	42312	42110	202	"	202	1487	12	13	24
	MVARH	16994	16850	144	"	144	1036	9	9	13
CITY of OCALA 69 KV SW. 323	MWH	78999	78814	263	"	263	1985	15	15	28
	MVARH	71376	71316	60	"	60	383	6	6	17
GAINESVILLE 69KV SW.82	-MWH	25176	25165	11	"	11	59	2	3	5
	+MWH	04949	04877	72	"	72	228	12	12	12
INGLIS 69KV SW.61	-MWH	22739	22466	273	"	273	1710	18	18	36
	+MWH	01171	01171	0	"	0	5	0	1	4
LEESBURG 69KVSW.297	-MWH	00811	00811	0	"	0	0	0	0	10
	+MWH	93103	92865	238	"	238	2071	15	15	27
CAP. SW.774	MVARH	44961	44665	296	"	296	2363	12	12	12

SWITCH OPERATION COUNTER

SW. NO.	READINGS PRES.	PREV.	OPERATIONS TODAY	MONTH	YEAR
61	772	772	0	1	14
82	688	688	0	0	8
111	189	189	0	0	7
291	383	383	0	0	11
292	147	147	0	0	4
295	191	191	2	0	4
297	447	447	0	0	9
323	340	340	0	0	6
695	1058	1058	0	0	11
774	178	178	0	0	3
4153	276	276	0	0	13

WEATHER

TIME	TEMP	CLEAR	CLOUDY	RAIN	LIGHTNING
8A	87	✓			
4P	90	✓			

FIRST OF MONTH METER READINGS

CIRCUIT		READING
TURNER 115KV SW291	-MWH	61326
	+MWH	66447
	-MVARH	41911
	+MVARH	18840
FORT WHITE 115 KV SW. 111	-MWH	42937
	+MWH	01361
	-MVARH	07788
	+MVARH	77471
115/69 KV BANK SW. 295	-MWH	88808
	+MWH	00002
	-MVARH	46639
	+MVARH	27273
CITY of OCALA 69KV SW.695	MWH	40825
	MVARH	15958
CITY of OCALA 69 KV SW.323	MWH	76742
	MVARH	70993
GAINESVILLE 69KV SW.82	-MWH	25117
	+MWH	04721
INGLIS 69KV SW.61	-MWH	21229
	+MWH	01116
LEESBURG 69KV SW.297	-MWH	00811
	+MWH	91082
CAP. SW.774	MVARH	42042

REMARKS: MW Peg Counter 12-1-= 20677 12-2-= 00274

OPERATOR	ON DUTY	OFF DUTY
Collins	8 AM	1 PM
Kerr	1 PM	5 PM

OD 31 K REV. 8-61

Hearing Exhibit No. 33

8-12-64

SILVER SPRINGS SUBSTATION

FLORIDA POWER CORPORATION — DAILY OPERATING REPORT — DAY Wednesday DATE 8-12-64

~~7-12-64~~

TIME E.S.T.	BUS VOLTAGE		115 KV TRANSMISSION LINES						TRANSFORMER BANK				69 KV TRANSMISSION LINES																CAPACITOR BANK SW. 774			
			FORT WHITE SW. 111			TURNER SW. 291			BANK SW. 295				CITY OF OCALA SW. 695			CITY OF OCALA SW. 323			GAINESVILLE SW. 82			INGLIS SW. 61			LEESBURG SW. 297							
	115	69	AMPS	MW	MVAR	AMPS	MW	MVAR	AMPS	MW	MVAR	TAP	AMPS	MW	MVAR	AMPS	MW	MVAR	AMPS	MW	MVAR	AMPS	MW	MVAR	AMPS	MW	MVAR	AMPS			MVAR
1A		120								-13																					
2		120								-12																					
3		120								-11																					
4		120								-11																					
5		120								-11																					
6		120								-12																					
7		119								-18																					
8		119								-24																					
9	115	117	80	-15	+1	75	-10	-10	220	-26	-9	17	10	+2	0	190	+19	+11	10	+1	-3	95	-11	+2	125	+9	+12	165	160	100	12.5
10	113	117	40	+4	-6	180	-35	-5	230	-27	-12	21	10	+2	0	195	+20	+11	60	+6	-4	75	-8	+2	125	+3	+14	100	160	100	12.5
11	111	113	90	+14	-10	210	-40	-7	230	-26	-16	25	135	+14	+9	95	+10	+7	75	+9	-4	95	-10	+4	135	+2	+16	100	160	100	12.5
12 N	110	118	110	+20	-12	230	-45	-7	240	-26	-17	27	135	+14	+10	100	+11	+9	70	+9	-3	90	-16	+4	140	+1	+16	100	160	100	12.5
1P	113	119	40	+6	-6	165	-24	-7	220	-24	-12	22	135	+14	+10	100	+11	+4	50	+6	-4	100	-11	+3	120	+2	+13	100	160	100	12.5
2	113	115	20	+2	-6	150	-28	-8	230	-26	-14	22	140	+14	+10	110	+11	+5	45	+5	-3	120	-14	+4	140	+16	+14	100	160	100	12.5
3	112	119	50	-4	-8	145	-26	-10	260	-29	-17	24	140	+14	+10	105	+11	+5	40	+4	-2	110	-13	+4	145	+10	+14	100	160	100	12.5
4	112	119	50	-4	-8	140	-25	-11	260	-29	-17	24	135	+14	+10	105	+11	+5	20	+3	-2	120	-14	+4	155	+12	+14	100	160	100	12.5
5	113	117	60	-11	-6	100	-16	-13	250	-27	-17	23	135	+14	+10	110	+11	+5	10	+2	-1	105	-12	+4	140	+11	+13	100	160	100	12.5
6		120								-25																					
7		119								-28																					
8		120								-50																					
9		120								-29																					
10		120								-24																					
11		117								-18																					
12MN		120								-16																					

INTEGRATING METERS

CIRCUIT		METER READINGS PRES.	PREV.	DIFF.	CONST	MWH OUTPUT TODAY	MONTH	MW DEMAND TODAY	MONTH	YEAR
TURNER 115KV SW291	-MWH	68167	67845	262	1000	262	1481	42	42	42
	+MWH	68119	68068	51	"	51	900	8	15	28
	-MVARH	53655	53332	279	"	279	3311	20	25	30
	+MVARH	18911	18911	0	"	0	18	0	4	9
FORT WHITE 115 KV SW. 111	-MWH	60552	60578	374	"	374	5481	31	39	50
	+MWH	01632	01591	41	"	41	63	15	15	43
	-MVARH	08777	08709	68	"	68	182	12	12	22
	+MVARH	82458	82367	91	"	91	1466	10	12	19
115/69 KV BANK SW. 295	-MWH	10572	10538	534	"	534	5963	31	38	42
	+MWH	00002	00002	0	6	0	0	0	6	6
	-MVARH	54080	53843	237	1000	237	1855	20	28	33
	+MVARH	27707	27706	1	"	1	144	2	10	15
CITY of OCALA 69KV SW.695	MWH	48021	47779	242	"	242	1437	14	14	26
	MVARH	20272	20122	150	"	150	606	10	10	13
CITY of OCALA 69KV SW. 323	MWH	92760	92516	244	"	244	4015	22	24	28
	MVARH	74466	74399	67	"	67	1653	12	14	17
GAINESVILLE 69KV SW.82	-MWH	25653	25640	13	"	13	214	2	3	5
	+MWH	45826	45778	48	"	48	274	9	9	12
INGLIS 69KV SW.61	-MWH	24935	24699	236	"	236	2739	14	16	36
	+MWH	02181	02180	1	"	1	22	0	3	4
LEESBURG 69KVSW.297	-MWH	10816	10816	0	"	0	0	0	0	16
	+MWH	01215	00779	436	"	436	2964	15	17	27
CAP. SW.774	MVARH	54726	54491	235	1000	235	3544	12	12	13

SWITCH OPERATION COUNTER

SW.NO.	READINGS PRES.	PREV.	OPERATIONS TODAY	MONTH	YEAR
61	775	775	0	3	17
82	679	679	0	1	9
111	185	185	0	0	7
291	386	386	0	1	13
292	147	147	0	0	8
295	191	191	0	0	4
297	452	457	1	4	13
323	340	340	0	0	6
695	1058	1058	0	0	11
774	178	178	0	0	3
A-153	278	278	0	1	15

WEATHER

TIME	TEMP	CLEAR	CLOUDY	RAIN	LIGHTNING
8A	72		✓		
4P	78		✓	✓	

FIRST OF MONTH METER READINGS

CIRCUIT		READING
TURNER 115KV SW291	-MWH	66626
	+MWH	68119
	-MVARH	50344
	+MVARH	18893
FORT WHITE 115 KV SW. 111	-MWH	55471
	+MWH	01569
	-MVARH	08595
	+MVARH	81992
115/69 KV BANK SW. 295	-MWH	04659
	+MWH	00002
	-MVARH	52125
	+MVARH	27563
CITY of OCALA 69KV SW.695	MWH	46644
	MVARH	19666
CITY of OCALA 69KV SW.323	MWH	84695
	MVARH	72811
GAINESVILLE 69KV SW.82	-MWH	25439
	+MWH	45652
INGLIS 69KV SW.61	-MWH	27492
	+MWH	01466
LEESBURG 69KV SW.297	-MWH	10816
	+MWH	98459
CAP. SW.774	MVARH	51242

REMARKS:

PC-1-23732
PC-2-04446
PC-3-00157

6:46 PM order #13
1:27 PM order #13 Comp.
1:27 PM order #14
3:16 PM order #14 release
3:18 PM order #15
7:19 PM order #15 Comp.

OPERATOR	ON DUTY	OFF DUTY
McPherson	8 AM	12 N
	4 PM	

OD 31 K — REV. 8-61

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8-17-64

FLORIDA POWER CORPORATION

8-17-64

SILVER SPRINGS SUBSTATION

DAILY OPERATING REPORT

Hearing Exhibit No. 33

DAY Mon DATE Aug 17-64

TIME E.S.T.	BUS VOLTAGE		115 KV TRANSMISSION LINES						TRANSFORMER BANK				69 KV TRANSMISSION LINES														CAPACITOR BANK SW. 774			
			FORT WHITE SW. 111			TURNER SW. 291			BANK SW. 295				CITY OF OCALA SW. 695			CITY OF OCALA SW. 323			GAINESVILLE SW. 82			INGLIS SW. 61			LEESBURG SW. 297			AMPS			MVAR
	115	69	AMPS	MW	MVAR	AMPS	MW	MVAR	AMPS	MW	MVAR	TAP	AMPS	MW	MVAR	AMPS	MW	MVAR	AMPS	MW	MVAR	AMPS	MW	MVAR	AMPS	MW	MVAR				
1A		119								-14																				
2		11								-14																				
3		120								-13																				
4		11								-14																				
5		119								-13																				
6		0								-14																				
7		118								-17																				
8		118								-24																				
9	114	117	70	-15	8	165	-14	-16	270	-28	-14	20	145	19	9	95	19	4	10	TX	0	140	-17	+4	145	+11	+12	100	100	100	12
10	112	118	70	+11	-4	170	-36	-3	220	-26	-7	21	145	15	10	95	11	3	65	+8	-4	120	-14	+6	120	+4	+1	"	"	"	"
11	113	118	60	+7	-4	150	-32	-3	200	-24	-8	21	150	15	10	90	11	4	70	+8	-3	140	-17	+4	140	+8	+1	"	"	"	"
12N	109	118	60	-1	-8	135	-33	-12	210	-28	-24	31	150	15	10	90	11	4	60	+8	-2	150	-18	+7	130	+8	+8	"	"	"	"
1P	107	118	60	-1	-8	135	-34	-12	230	-26	-18	24	140	15	10	100	10	4	30	+4	-2	150	-18	+7	155	+13	+14	"	"	"	"
2	112	118	50	-1	-3	150	-37	-13	250	-26	-20	26	150	15	11	105	11	4	40	+6	-2	150	-18	+8	145	+9	+10	"	"	"	"
3	111	118	50	+5	-8	155	-38	-12	270	-26	-20	26	140	14	10	100	10	5	55	+7	-2	145	-17	+8	145	+8	+11	"	"	"	"
4	110	118	60	+4	-7	160	-39	-12	250	-24	-18	24	140	14	10	100	11	5	55	+7	-3	135	-14	+7	140	+3	+5	"	"	"	"
5	113	119	50	+1	-7	150	-27	-11	260	-35	-17	23	140	14	10	105	11	4	55	+7	-3	110	-14	+5	135	+7	+13	"	"	"	"
6		11								-30																				
7		118								-27																				
8		119								-28																				
9		119								-27																				
10		119								-23																				
11		119								-21																				
12MN		119								-18																				

INTEGRATING METERS

CIRCUIT		METER READINGS PRES.	METER READINGS PREV.	DIFF.	CONST.	MWH OUTPUT TODAY	MWH OUTPUT MONTH	MW DEMAND TODAY	MW DEMAND MONTH	MW DEMAND YEAR
TURNER 115KV SW291	-MWH	68955	68718	237	1000	237	2329	43	43	43
	+MWH	69327	69257	70	"	70	1208	8	15	28
	-MVARH	55161	54746	305	"	305	9057	21	25	30
	+MVARH	18914	18913	1	"	1	21	0	4	9
FORT WHITE 115 KV SW. 111	-MWH	63073	62680	393	"	393	7602	35	39	50
	+MWH	01725	01684	41	"	41	156	18	18	18
	-MVARH	08923	08864	59	"	59	928	15	15	22
	+MVARH	82955	82857	98	"	98	1963	12	12	19
115/69 KV BANK SW. 295	-MWH	13100	12588	512	"	512	8441	30	38	42
	+MWH	00002	00002	0	"	0	0	0	0	6
	-MVARH	55088	54842	246	"	246	2963	27	28	30
	+MVARH	27719	27719	0	"	0	156	0	10	15
CITY of OCALA 69KV SW.695	MWH	49376	49017	359	"	359	2632	15	15	22
	MVARH	29982	29824	158	"	158	1316	10	10	13
CITY of OCALA 69 KV SW. 323	MWH	84781	84554	227	"	227	5096	13	24	28
	MVARH	74699	74645	54	"	54	1888	5	14	17
GAINESVILLE 69 KV SW. 82	-MWH	25727	25713	14	"	14	288	3	4	5
	+MWH	46084	46027	57	"	57	932	9	9	12
INGLIS 69 KV SW. 61	-MWH	31467	31175	292	"	292	3923	19	19	26
	+MWH	01182	01182	0	"	0	22	0	3	4
LEESBURG 69 KVSW.297	-MWH	00816	00816	0	"	0	0	0	0	0
	+MWH	02766	02504	262	"	262	4309	16	17	22
CAP. SW.774	MVARH	56254	55962	292	"	292	5612	17	17	13

SWITCH OPERATION COUNTER

SW. NO.	READINGS PRES.	READINGS PREV.	OPERATIONS TODAY	OPERATIONS MONTH	OPERATIONS YEAR
61	776	775	1	4	18
82	689	689	0	1	9
111	191	190	1	1	8
291	387	386	1	2	15
292	147	147	0	0	4
295	141	141	0	0	4
297	457	452	5	4	14
323	341	340	1	1	7
695	1059	1058	1	1	12
774	129	129	0	1	4
ABS	208	208	0	1	15

WEATHER

TIME	TEMP	CLEAR	CLOUDY	RAIN	LIGHTNING
8A	84	✓			
4P	88			✓	

FIRST OF MONTH METER READINGS

CIRCUIT		READING
TURNER 115KV SW291	-MWH	66126
	+MWH	68119
	-MVARH	50344
	+MVARH	18893
FORT WHITE 115 KV SW. 111	-MWH	53471
	+MWH	01569
	-MVARH	08595
	+MVARH	80992
115/69 KV BANK SW. 295	-MWH	44659
	+MWH	00002
	-MVARH	52125
	+MVARH	27563
CITY of OCALA 69KV SW.695	MWH	46644
	MVARH	19666
CITY of OCALA 69KV SW.323	MWH	84685
	MVARH	72877
GAINESVILLE 69KV SW.82	-MWH	25427
	+MWH	45652
INGLIS 69KV SW.61	-MWH	27492
	+MWH	01160
LEESBURG 69KV SW.297	-MWH	00816
	+MWH	98459
CAP. SW.774	MVARH	51292

REMARKS:

Key Centr

DC-1 - 23919.

DC-2 - 09722

9:34A - Plant A 23

9:30 opened Sw. 32 & 695 & Removed from William, City Single-

1:26 Pm 291-2 D/C

OPERATOR	ON DUTY	OFF DUTY
[illegible]	7A	12N
[illegible]	12N	4P

(1541)

OD 31 K

REV. 8-61

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7-8-64

FLORIDA POWER CORPORATION

7-8-64

FORT WHITE SUBSTATION

DAILY OPERATING REPORT

TIME E.S.T.	BUS VOLTAGE 110KV	BUS VOLTAGE 66KV	BANK TAP	110 KV. TRANSMISSION LINES: SUWANNEE SW. 961 AMP	MW	MVAR	JASPER SW. 955 WEST CIRCUIT AMP	MW	MVAR	INGLIS SW. 954 WEST CIRCUIT AMP	MW	MVAR	JASPER SW. 952 EAST CIRCUIT AMP	MW	MVAR	INGLIS SW. 953 EAST CIRCUIT AMP	MW	MVAR	SILVER SPRINGS SW. 991 AMP	MW	MVAR	TRANSFORMER 110/66 KV SW. 364 AMP	MW	MVAR	66 KV. TRANSMISSION LINES: DRIFTON SW. 363 AMP	MW	MVAR	JASPER SW. 352 AMP	MW	MVAR	HIGH SPRINGS SW. 350 AMP	MW	MVAR	TIME E.S.T.	REMARKS
1A		121																			- 7											1A	
2		121																			- 7											2	
3		121																			- 7											3	
4		121																			- 6											4	
5		121																			- 7											5	
6		121																			- 7											6	
7	116	120	19	120	- 24	+ 8	50	- 8	0	50	+ 6	- 8	60	- 10	+ 2	50	+ 6	- 8	120	+ 24	- 4	110	- 8	- 10	50	- 1	+ 5	50	0	+ 7	80	+ 10	- 3	7	
8	116	120	19	150	- 30	+ 8	75	- 12	+ 1	65	+ 2	- 8	70	- 12	+ 5	60	+ 8	- 10	160	+ 32	- 6	120	- 9	- 10	60	- 1	+ 5	60	- 1	+ 8	110	+ 13	- 4	8	
9	115	119	21	130	- 36	+ 3	50	- 8	0	30	+ 4	- 6	50	- 8	0	50	+ 4	- 7	150	+ 30	- 4	120	- 10	- 12	60	- 1	+ 5	55	- 1	+ 7	100	+ 12	- 2	9	
10	116	120	22	110	- 23	- 2	25	- 4	- 2	25	- 4	- 2	25	- 4	- 2	25	- 4	- 2	70	+ 14	0	160	- 14	- 14	40	0	+ 4	50	0	+ 6	130	+ 16	+ 1	10	
11	115	121	23	50	- 1	- 10	80	+ 11	- 8	100	- 18	+ 6	70	+ 10	- 8	90	- 16	+ 5	20	- 2	+ 4	170	- 16	- 13	40	+ 3	+ 1	50	+ 5	+ 4	80	+ 7	+ 7	11	
12N	115	121	23	40	- 6	- 3	40	+ 7	- 6	70	- 14	+ 3	60	+ 7	- 10	80	- 15	+ 3	40	+ 4	+ 2	170	- 16	- 14	30	+ 2	+ 1	40	+ 4	+ 5	90	+ 8	+ 6	12N	
1P	115	121	22	30	- 4	- 8	60	+ 6	- 6	60	- 12	+ 4	60	+ 6	- 6	70	- 15	+ 3	20	+ 2	+ 3	170	- 16	- 14	30	+ 3	+ 2	30	+ 3	+ 5	90	+ 9	+ 5	1P	
2	114	121	21	65	+ 4	- 13	90	+ 12	- 10	110	- 20	+ 10	90	+ 14	- 10	100	- 20	+ 6	50	- 6	+ 7	185	- 17	- 15	50	+ 4	0	50	+ 6	+ 4	85	+ 4	+ 9	2	
3	115	121	26	55	- 4	- 10	65	+ 7	- 8	90	- 15	+ 2	70	+ 8	- 10	80	- 15	+ 3	20	+ 5	+ 3	195	- 18	- 17	70	+ 5	+ 2	50	+ 4	+ 5	20	+ 4	+ 7	3	
4	115	121	26	55	- 8	- 8	45	+ 3	- 7	60	- 12	+ 1	60	+ 5	- 7	75	- 14	+ 2	55	+ 10	+ 4	175	- 14	- 16	30	+ 2	+ 2	50	+ 4	+ 5	70	+ 6	+ 7	4	
5	115	121	26	60	- 10	- 6	30	+ 2	- 6	50	- 10	+ 1	50	+ 5	- 8	50	- 10	+ 1	60	+ 12	+ 3	170	- 14	- 16	30	+ 2	+ 2	50	+ 3	+ 6	70	+ 7	+ 5	5	
6	115	121	26	140	- 30	0	60	- 10	- 1	50	+ 4	- 7	70	- 14	+ 1	60	+ 4	- 8	170	+ 34	- 2	165	- 13	- 16	55	0	+ 3	60	+ 1	+ 2	120	+ 16	0	6	
7	115	120	25	150	- 30	+ 1	90	- 15	+ 1	60	+ 6	- 9	80	- 14	+ 1	50	+ 5	- 9	200	+ 44	- 3	155	- 12	- 14	70	- 1	+ 6	65	- 2	+ 7	130	+ 16	- 1	7	
8	114	120	26	150	- 30	- 1	90	- 14	0	40	+ 3	- 7	80	- 15	0	45	+ 6	- 10	210	+ 48	- 1	170	- 13	- 15	65	- 1	+ 5	70	- 3	+ 7	150	+ 14	- 1	8	
9	115	120	26	170	- 35	0	70	- 12	0	40	+ 2	- 8	80	- 15	+ 2	60	+ 5	- 10	230	+ 46	- 3	160	- 13	- 15	70	- 1	+ 6	70	- 2	+ 8	150	+ 16	- 1	9	
10		121																			- 11											10	
11		120																			- 9											11	
12MN		121																			- 9											12MN	

INTEGRATING METERS

CIRCUIT		METER READINGS PRES	PREV	DIFF	CONST	MWH OUTPUT TODAY	MONTH	MW. DEMAND TODAY	MONTH	YEAR	1st OF MO. READING
SUWANNEE SW. 961	+MWH	00437	00435	2	1000	2	2	4	4	5	00435
	-MWH	54537	54061	476	"	476	4511	37	43	64	56026
	+MVARH	89474	89468	74	"	74	216	10	11	19	82152
	-MVARH	08737	08668	69	"	69	122	16	16	26	08415
JASPER WEST SW. 955	+MWH	34475	34426	49	"	49	87	10	10	12	34388
	-MWH	92761	92561	200	"	200	1893	14	18	30	90208
	+MVARH										
	-MVARH										
INGLIS WEST SW. 954	+MWH	39052	38970	82	"	82	287	7	13	32	38265
	-MWH	74830	74723	107	"	107	251	19	19	26	74579
	+MVARH										
	-MVARH										
JASPER EAST SW. 952	+MWH	08305	08258	47	"	47	85	13	13	15	08220
	-MWH	29460	29462	198	"	198	1878	17	18	30	27722
	+MVARH	32039	32005	34	"	34	407	4	7	12	31632
	-MVARH	16271	16804	67	"	67	125	13	13	16	16746
INGLIS EAST SW. 953	+MWH	06768	06688	80	"	80	760		13	24	06608
	-MWH	16658	16550	108	"	108	255	8	18	25	16463
	+MVARH	01007	00983	24	"	24	36	7	7	10	00971
	-MVARH	35476	35329	147	"	147	1518	12	14	27	33958
SILVER SPGS. SW. 991	+MWH	37184	36630	554	"	554	5214	44	53	58	31970
	-MWH	01066	01062	4	"	4	4	2	2	2	01062
	+MVARH	02031	02007	24	"	24	56	6	6	18	01975
	-MVARH	21610	21540	70	"	70	597	7	8	13	21013

CIRCUIT		METER READINGS PRES	PREV	DIFF	CONST	MWH OUTPUT TODAY	MONTH	MW. DEMAND TODAY	MONTH	YEAR	1st OF NO. READING
TRANSF. 110/66 KV SW. 364	+MWH	00387	00387	0	1000	0	0	0	4	4	00326
	-MWH	22958	22686	272	"	272	1791	17	17	20	21167
	+MVARH	10666	10666	0	"	0	0	0	0	12	10666
	-MVARH	98136	97794	342	"	342	2206	17	17	22	95930
DRIFTON SW. 363	+MWH	62533	62508	25	"	25	47	4	4	7	62486
	-MWH	89025	88980	45	"	45	439	4	5	10	88586
	+MVARH										
	-MVARH										
JASPER SW. 352	+MWH	90811	90780	31	"	31	124	5	5	2	90687
	-MWH	31277	31250	27	"	27	195	3	4	10	31082
	+MVARH										
	-MVARH										
HIGH SPGS. SW. 350	+MWH	53425	53143	282	"	282	2196	19	20	29	51829
	-MWH	03823	03823	0	"	0	0	0	0	0	03823
	+MVARH										
	-MVARH										

TRANSF. TEMP. DEG. C.

TIME	115/69 3 PH	69/12 KV 1	2	3
8A	50	45	45	45
12N	57	46	40	46
4P	59	48	48	47

WEATHER

TIME	TEMP	CLEAR, CLOUDY, RAIN, LTNG
8A	78	X
4P	95	X

+ INDICATES OUT

- INDICATES IN

OPERATION COUNTER

SW.	READINGS PRES	PREV	TODAY
350	542	542	
352	759	759	
363	458	458	
364	438	438	
951	302	302	
952	300	300	
953	504	504	
954	962	962	
955	674	674	
A-20	390	390	
BANK	42826	42807	19
961	315	315	
991	248	248	
956	186	186	

7-8-64

FORT WHITE SUBSTATION
DAILY OPERATING REPORT

Hearing Exhibit No. 33 (1121)

DAY Wednesday DATE 7 - 8 1964

TRANSMISSION LINES										TRANSFORMER			66 KV. TRANSMISSION LINES									TIME	REMARKS: SWITCHING, RELAY TARGETS, UNUSUAL CONDITIONS.
954 CUIT	JASPER SW. 952 EAST CIRCUIT			INGLIS SW. 953 EAST CIRCUIT			SILVER SPRINGS SW. 991			110/66 KV SW. 364			DRIFTON SW. 363			JASPER SW. 352			HIGH SPRINGS SW. 350				
MVAR	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	E.S.T.	
											- 7											1A	
											- 7											2	
											- 7											3	
											- 6											4	
											- 7											5	
											- 7											6	
- 8	60	- 10	+ 2	50	+ 6	- 8	120	+ 24	- 4	110	- 8	- 10	50	- 1	+ 5	50	0	+ 7	50	+ 10	- 3	7	
- 8	70	- 12	+ 5	60	+ 8	- 10	160	+ 32	- 6	120	- 9	- 10	60	- 1	+ 5	60	- 1	+ 8	110	+ 13	- 14	8	
- 6	56	- 8	+ 6	50	+ 4	- 7	150	+ 30	- 4	120	- 10	- 12	60	- 1	+ 5	55	- 1	+ 7	100	+ 12	- 2	9	
- 2	25	- 4	- 2	25	- 4	- 2	70	+ 14	0	160	- 14	- 14	40	0	+ 4	50	0	+ 6	130	+ 16	+ 1	10	
+ 6	70	+ 10	- 8	90	- 16	+ 5	20	- 2	+ 4	170	- 16	- 13	40	+ 3	+ 1	50	+ 5	+ 4	80	+ 7	+ 7	11	
+ 3	60	+ 7	- 10	80	- 15	+ 3	40	+ 4	+ 2	170	- 16	- 14	30	+ 2	+ 1	40	+ 4	+ 5	90	+ 8	+ 6	12N	
+ 4	60	+ 6	- 6	70	- 15	+ 3	20	+ 2	+ 3	170	- 16	- 14	30	+ 3	+ 2	30	+ 3	+ 5	80	+ 9	+ 5	1P.	
+ 10	80	+ 11	- 10	100	- 20	+ 6	50	- 6	+ 7	185	- 17	- 15	50	+ 4	0	50	+ 6	+ 4	95	+ 4	+ 9	2	
+ 5	70	+ 8	- 10	80	- 15	+ 3	30	+ 2	+ 3	195	- 11	- 17	50	+ 3	+ 2	50	+ 4	+ 5	120	+ 4	+ 7	3	
+ 1	60	+ 5	- 7	55	- 11	+ 2	55	+ 10	+ 4	175	- 14	- 16	30	+ 2	+ 2	50	+ 4	+ 5	70	+ 6	+ 7	4	
+ 1	50	+ 5	- 5	50	- 10	+ 1	60	+ 12	+ 3	170	- 14	- 16	30	+ 2	+ 2	50	+ 3	+ 6	70	+ 7	+ 5	5	
- 7	70	- 14	+ 1	60	+ 4	- 7	170	+ 34	- 2	165	- 13	- 14	55	0	+ 5	60	- 1	+ 7	130	+ 16	0	6	
- 9	80	- 14	+ 1	50	+ 5	- 9	200	+ 40	- 3	155	- 12	- 14	70	- 1	+ 6	65	- 2	+ 8	130	+ 16	- 1	7	
- 7	90	- 15	0	65	+ 6	- 10	240	+ 48	- 1	170	- 13	- 15	65	- 1	+ 5	70	- 3	+ 8	150	+ 19	- 1	8	
- 6	90	- 13	+ 4	60	+ 5	- 10	230	+ 46	- 3	160	- 13	- 15	70	- 1	+ 6	70	- 2	+ 8	150	+ 18	- 1	9	
											- 11											10	
											- 9											11	
											- 9											12MN	

INTEGRATING METERS

DEMAND MONTH	DEMAND YEAR	1st OF MO. READING	CIRCUIT		METER READINGS PRES	METER READINGS PREV	METER READINGS DIFF	METER READINGS CONST	MWH OUTPUT TODAY	MWH OUTPUT MONTH	MW. DEMAND TODAY	MW. DEMAND MONTH	MW. DEMAND YEAR	1st OF MO. READING
4	5	66435	TRANSF. 110/66 KV SW. 364	+MWH	00387	00387	0	1000	0	0	0	4	4	00386
43	64	56026		-MWH	22958	22686	272	"	272	1791	17	17	20	21167
11	19	82152		+MVARH	10666	10666	0	"	0	0	0	0	12	10666
16	24	08415		-MVARH	98136	97794	342	"	342	2204	17	17	22	95930
10	12	34388	DRIFTON SW. 363	+MWH	62533	62508	25	"	25	47	4	4	7	62486
18	30	90208		-MWH	89025	88980	45	"	45	439	4	5	10	88586
				+MVARH										
				-MVARH										
13	32	38265	JASPER SW. 352	+MWH	90811	90780	31	"	31	124	5	5	9	90687
19	26	74579		-MWH	31277	31250	27	"	27	198	3	4	10	31082
				+MVARH										
				-MVARH										
13	15	02220	HIGH SPGS. SW. 350	+MWH	53425	53143	282	"	282	2196	19	20	29	51229
18	30	27722		-MWH	03823	03823	0	"	0	0	0	0	0	03823
7	12	31632		+MVARH										
13	16	16746		-MVARH										
13	24	06008												
18	25	16463												
7	10	00971												
14	27	33958												
53	58	31970												
2	2	01662												
6	18	01975												
9	13	21013												

OPERATION COUNTERS

SW.	READINGS PRES	READINGS PREV	OPERATIONS TODAY	OPERATIONS MONTH	OPERATIONS YEAR
350	542	542		20	27
352	759	759			8
363	458	458		2	12
364	438	438			8
951	302	302			6
952	300	300			11
953	504	504			16
954	862	862			13
955	674	674			13
A-20	390	390		5	26
BANK	42826	42807	19	173	6169
961	315	315			4
991	248	248			16
956	186	186			10

TRANSF. TEMP. DEG. C.

	115/69	69/12 KV		
TIME	3 PH	1	2	3
8A	50	45	43	45
12N	57	46	46	46
4P	59	48	48	47

WEATHER

TIME	TEMP	CLEAR, CLOUDY, RAIN, LTNG.
8A	78	X
4P	95	X

+ INDICATES OUT
- INDICATES IN

OPERATOR	ON DUTY	OFF DUTY
Jackson	7AM	2PM
L. Hardy	2PM	9PM

REV. 2-28-61

8-12-64

FLORIDA POWER CORPORATION

8-12-64

FORT WHITE SUBSTATION

DAILY OPERATING REPORT

TIME E.S.T.	BUS VOLTAGE 110KV	BUS VOLTAGE 66KV	BANK TAP	110 KV. TRANSMISSION LINES: SUWANNEE SW.961 AMP	SUWANNEE SW.961 MW	SUWANNEE SW.961 MVAR	JASPER SW. 955 WEST CIRCUIT AMP	JASPER SW. 955 WEST CIRCUIT MW	JASPER SW. 955 WEST CIRCUIT MVAR	INGLIS SW. 954 WEST CIRCUIT AMP	INGLIS SW. 954 WEST CIRCUIT MW	INGLIS SW. 954 WEST CIRCUIT MVAR	JASPER SW. 952 EAST CIRCUIT AMP	JASPER SW. 952 EAST CIRCUIT MW	JASPER SW. 952 EAST CIRCUIT MVAR	INGLIS SW. 953 EAST CIRCUIT AMP	INGLIS SW. 953 EAST CIRCUIT MW	INGLIS SW. 953 EAST CIRCUIT MVAR	SILVER SPRINGS SW. 991 AMP	SILVER SPRINGS SW. 991 MW	SILVER SPRINGS SW. 991 MVAR	TRANSFORMER 110/66 KV SW. 364 AMP	TRANSFORMER 110/66 KV SW. 364 MW	TRANSFORMER 110/66 KV SW. 364 MVAR	66 KV. TRANSMISSION LINES: DRIFTON SW. 363 AMP	DRIFTON SW. 363 MW	DRIFTON SW. 363 MVAR	JASPER SW. 382 AMP	JASPER SW. 382 MW	JASPER SW. 382 MVAR	HIGH SPRINGS SW. 350 AMP	HIGH SPRINGS SW. 350 MW	HIGH SPRINGS SW. 350 MVAR	TIME E.S.T.	REMARKS:
1A		121																					- 8												1A	#36.3
2		121																					- 7												2	#954
3		120																					- 7												3	
4		120																					- 7												4	
5		121																					- 7												5	
6		120																					- 8												6	
7	116	120	21	140	-28	+5	80	-13	+2	75	+10	-10	75	-12	+7	50	+5	-8	120	+24	-7	115	- 8	- 11	55	- 1	+4	60	-2	+7	100	+12	-7	7	
8	117	121	21	110	-22	+1	45	-7	0	20	+3	- 6	40	- 7	0	70	+2	-5	120	+24	- 4	110	- 9	- 10	50	0	+4	50	-1	+7	90	+11	-2	8	
9	116	120	21	100	-20	0	30	-6	- 1	10	+1	- 5	10	- 4	0	10	- 1	- 5	120	+24	- 1	130	- 10	- 11	45	0	+3	50	0	+7	90	+11	-1	9	
10	115	120	21	60	- 9	- 9	60	+8	- 6	75	-13	+5	55	+3	- 6	65	-13	+4	70	+3	+4	130	- 13	- 16	10	+1	+1	50	+6	+3	50	+14	+4	10	
11	114	121	24	90	+6	- 19	110	+16	- 10	140	- 24	+14	120	+19	- 17	150	- 25	+12	55	- 8	+ 5	150	- 15	- 12	20	+3	0	70	+9	+7	65	0	+8	11	
12N	115	122	24	60	0	- 12	75	+11	- 8	100	- 16	+8	70	+11	- 9	110	- 20	+10	20	- 3	+ 5	150	- 15	- 12	20	+3	0	60	+1	+3	55	+2	+6	12N	
1P	116	121	22	55	- 8	- 6	70	+4	- 6	50	- 10	+2	50	+5	- 7	55	- 11	+7	55	+10	+2	110	- 12	- 12	20	+2	+1	50	+4	+5	50	+5	+2	1P	
2	115	121	22	50	- 7	- 7	50	+6	- 6	65	- 12	+4	50	+6	- 6	65	- 12	+4	50	+9	+4	135	- 12	- 11	20	+2	+1	70	+4	+4	50	+4	+4	2	
3		121																					- 12												3	
4		121																					- 12												4	
5		120																					- 11												5	
6		121																					- 10												6	
7		120																					- 10												7	
8		120																					- 11												8	
9		120																					- 10												9	
10		120																					- 9												10	
11		120																					- 9												11	
12MN		120																					- 9												12MN	

INTEGRATING METERS

CIRCUIT		METER READINGS PRES	PREV	DIFF	CONST	MWH OUTPUT TODAY	MONTH	MW. DEMAND TODAY	MONTH	YEAR	1st OF MO. READING
SUWANNEE SW. 961	+MWH	00453	00448	5	1000	5	5	3	3	3	00448
	-MWH	74727	73803	489	11	489	7534	40	47	64	66763
	+MVARH	74765	74171	82	11	82	1251	9	13	19	83021
	-MVARH	69273	69195	79	11	78	277	18	18	26	69696
JASPER WEST SW. 955	+MWH	35398	35337	61	11	61	230	14	14	14	35168
	-MWH	00698	00481	217	11	217	2978	18	23	30	27276
	+MVARH										
	-MVARH										
INGLIS WEST SW. 954	+MWH	42977	42862	115	11	115	1643	11	18	32	41334
	-MWH	29157	72041	117	11	117	609	22	22	26	76548
	+MVARH										
	-MVARH										
JASPER EAST SW. 952	+MWH	09211	09150	61	11	61	243	16	16	16	02768
	-MWH	37524	37309	215	11	215	2946	19	23	30	34572
	+MVARH	33714	33666	48	11	48	662	5	2	12	33022
	-MVARH	18266	18200	66	11	66	405	13	13	16	17761
INGLIS EAST SW. 953	+MWH	10613	10498	115	11	115	1624	12	18	24	09797
	-MWH	18996	18879	117	11	117	611	22	22	25	12385
	+MVARH	01467	01432	35	11	35	211	11	11	11	01756
	-MVARH	11127	11314	161	11	161	2255	13	17	27	37220
SILVER SPGS. SW. 991	+MWH	59493	58937	556	11	556	8107	40	48	58	58393
	-MWH	01076	01070	6	11	6	6	3	3	3	01070
	+MVARH	02570	02530	40	11	40	116	8	8	8	02454
	-MWH	24168	24112	57	11	57	858	6	9	9	23211

CIRCUIT		METER READINGS PRES	PREV	DIFF	CONST	MWH OUTPUT TODAY	MONTH	MW. DEMAND TODAY	MONTH	YEAR	1st OF MO. READING
TRANSF. 110/66 KV SW. 364	+MWH	00387	00387	0	1000	0	0	0	0	4	00387
	-MWH	31116	30872	244	11	241	2763	15	15	20	28353
	+MVARH	10666	10666	0	11	0	0	0	0	12	10666
	-MVARH	08385	08092	293	11	293	3577	14	17	22	08209
DRIFTON SW. 363	+MWH	62956	62931	25	11	25	70	5	5	7	62936
	-MWH	98659	98615	50	11	50	725	5	6	10	98690
	+MVARH										
	-MVARH										
JASPER SW. 352	+MWH	91569	91525	44	11	44	227	9	9	9	91342
	-MWH	32325	32292	33	11	33	435	14	6	10	31840
	+MVARH										
	-MVARH										
HIGH SPGS. SW. 350	+MWH	63219	63969	250	11	250	3584	18	21	29	59635
	-MWH	63724	63824	0	11	0	1	0	1	1	22823
	+MVARH										
	-MVARH										

TRANSF. TEMP. DEG. C.

TIME	115/69 3 PH	69/12 KV 1	2	3
8A	50	40	40	36
12N	50	40	40	39
4P				

WEATHER

TIME	TEMP	CLEAR, CLOUDY, RAIN, LTNG
8A	75	X
4P		

+ INDICATES OUT

- INDICATES IN

OPERATION COUNTER

SW.	READINGS PRES	READINGS PREV	OPE TODAY	OPE MO
350	543	543		
352	764	764		
363	4627	4461	1	
364	439	439		
951	303	303		
952	301	301		
953	514	514		
954	870	869	1	
955	674	674		
A-20	401	401		
BANK	45167	44467	75	
961	316	316		
991	250	250		
256	187	187		

8-12-64

FORT WHITE SUBSTATION
DAILY OPERATING REPORT

Hearing Exhibit No. 33 (1122)

DAY Wednesday DATE 8-12-64

ION LINES									TRANSFORMER			66 KV. TRANSMISSION LINES									TIME	
PER SW. 952 T CIRCUIT		INGLIS SW. 953 EAST CIRCUIT			SILVER SPRINGS SW. 991				110/66 KV SW. 364			DRIFTON SW. 363			JASPER SW. 382			HIGH SPRINGS SW. 350				
MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	E.S.T.	REMARKS: SWITCHING, RELAY TARGETS, UNUSUAL CONDITIONS.
										- 8											
										- 7										1A	#363 1107 Am gas 1 time Fire DF
										- 7										2	#954 - 2346 Pm gas 1 time All in DK HS
										- 7										3	
										- 7										4	
										- 7										5	
										- 8										6	
+12	+7	50	+5	-8	120	+24	-7	115	- 8	- 11	55	-1	+4	60	-2	+7	100	+12	-7	7	
-7	0	70	+2	-6	120	+24	-4	110	- 9	- 10	50	0	+4	50	-1	+7	90	+11	-2	8	
-4	0	10	-1	-5	120	+24	-1	130	- 10	- 11	45	0	+3	50	0	+7	80	+11	-1	9	
+5	-6	65	-13	+4	70	+7	+4	120	- 13	- 10	10	+1	+1	50	+6	+7	50	+14	+4	10	
+19	-17	150	-25	+12	55	-8	+8	150	- 15	- 12	20	+3	0	70	+9	+7	65	0	+8	11	
+11	-7	110	-20	+10	20	-7	+5	150	- 15	- 12	20	+3	0	60	+7	+7	55	+2	+6	12N	
+5	-7	55	-11	+7	55	+10	+7	110	- 12	- 12	20	+2	+1	50	+4	+5	30	+5	+7	1P	
+6	-6	65	-12	+4	50	+9	+4	135	- 12	- 11	20	+2	+1	30	+4	+4	50	+4	+4	2	
									- 12											3	
									- 12											4	
									- 11											5	
									- 10											6	
									- 10											7	
									- 11											8	
									- 10											9	
									- 9											10	
									- 9											11	
									- 9											12MN	

INTEGRATING METERS

1st OF MO. READING	CIRCUIT		METER READINGS PRES	PREV	DIFF	CONST	MWH OUTPUT TODAY	MONTH	MW. DEMAND TODAY	MONTH	YEAR	1st OF MO. READING
00443	TRANSF. 110/66 KV SW. 364	+MWH	00387	00387	0	1000	0	0	0	0	4	00387
64763		-MWH	31116	30872	244	11	244	2763	15	15	20	28353
33021		+MVARH	10666	10666	0	11	0	0	0	0	12	10666
07696		-MVARH	08385	08092	293	11	293	3577	14	17	22	08207
35468	DRIFTON SW. 363	+MWH	12856	12731	25	11	25	70	5	5	7	12836
27776		-MWH	98165	98915	50	11	50	775	5	6	10	98190
		+MVARH										
		-MVARH										
41334	JASPER SW. 352	+MWH	31569	31525	44	11	44	227	9	9	9	31312
76-46		-MWH	32325	32292	33	11	33	435	14	6	10	31340
		+MVARH										
		-MVARH										
02968	HIGH SPGS. SW. 350	+MWH	63218	62967	250	11	250	3584	18	21	29	59635
31577		-MWH	63224	63224	0	11	0	1	0	1	1	03823
23062		+MVARH										
17761		-MVARH										
05797												
17385												
01356												

TRANSF. TEMP. DEG. C.

	115/69	69/12 KV		
TIME	3 PH	1	2	3
8A	50	40	40	36
12N	50	40	40	39
4P				

WEATHER

TIME	TEMP	CLEAR, CLOUDY, RAIN, LTNG
8A	75	X
4P		

+ INDICATES OUT
- INDICATES IN

OPERATION COUNTERS

SW.	READINGS PRES	PREV	OPERATIONS TODAY	MONTH	YEAR
350	543	543			28
352	764	764			13
363	462	461	1	2	16
364	439	439			9
951	303	303			6
952	301	301		1	12
953	514	514		3	18
954	870	869	1	4	17
955	674	674			13
A-20	401	401		4	37
BANK	43667	43642	25	270	7048
961	316	316			5
991	250	250			12
256	187	187			11

OPERATOR	ON DUTY	OFF DUTY
Lucas Hardy	7Hr.	3Hr.

REV. 2-20-61

8-17-64

FLORIDA POWER CORPORATION

8-17-64

FORT WHITE SUBSTATION
DAILY OPERATING REPORT

TIME E.S.T.	BUS VOLTAGE 110 KV	BUS VOLTAGE 66KV	BANK TAP	110 KV. TRANSMISSION LINES: SUWANNEE SW.961 AMP	SUWANNEE SW.961 MW	SUWANNEE SW.961 MVAR	JASPER SW. 955 WEST CIRCUIT AMP	JASPER SW. 955 WEST CIRCUIT MW	JASPER SW. 955 WEST CIRCUIT MVAR	INGLIS SW. 954 WEST CIRCUIT AMP	INGLIS SW. 954 WEST CIRCUIT MW	INGLIS SW. 954 WEST CIRCUIT MVAR	JASPER SW. 952 EAST CIRCUIT AMP	JASPER SW. 952 EAST CIRCUIT MW	JASPER SW. 952 EAST CIRCUIT MVAR	INGLIS SW. 953 EAST CIRCUIT AMP	INGLIS SW. 953 EAST CIRCUIT MW	INGLIS SW. 953 EAST CIRCUIT MVAR	SILVER SPRINGS SW. 991 AMP	SILVER SPRINGS SW. 991 MW	SILVER SPRINGS SW. 991 MVAR	TRANSFORMER 110/66 KV SW. 364 AMP	TRANSFORMER 110/66 KV SW. 364 MW	TRANSFORMER 110/66 KV SW. 364 MVAR	66 KV. TRANSMISSION LINES: DRIFTON SW. 363 AMP	DRIFTON SW. 363 MW	DRIFTON SW. 363 MVAR	JASPER SW. 352 AMP	JASPER SW. 352 MW	JASPER SW. 352 MVAR	HIGH SPRINGS SW. 350 AMP	HIGH SPRINGS SW. 350 MW	HIGH SPRINGS SW. 350 MVAR	TIME E.S.T.	REMARKS
1A		120																					- 7												1A	8-5-64
2		120																					- 7												2	9-5-64
3		121																					- 8												3	
4		120																					- 7												4	
5		119																					- 6												5	
6		119																					- 7												6	
7	116	119	23	150	- 32	+ 5	70	- 12	+ 1	55	+ 6	- 7	50	- 8	0	25	+ 3	- 7	160	+ 32	- 2	120	- 9	- 11	60	- 2	+ 5	60	- 1	+ 8	120	+ 15	- 4	7	
8	114	121	22	170	- 35	+ 4	80	- 15	+ 2	70	+ 10	- 10	100	- 16	+ 3	35	+ 8	- 10	200	+ 40	- 6	140	- 10	- 14	70	- 2	+ 6	70	- 3	+ 8	120	+ 13	- 3	8	
9	115	120	24	130	- 24	- 2	25	- 4	0	20	0	- 6	25	- 4	0	20	0	- 6	130	+ 26	- 2	150	- 12	- 14	60	- 1	+ 5	50	+ 3	+ 6	100	+ 12	+ 1	9	
10	114	122	26	70	- 1	- 15	80	+ 10	- 8	120	- 20	+ 12	90	+ 14	- 10	130	- 22	+ 12	40	- 6	+ 2	170	- 16	- 14	30	+ 9	+ 1	70	+ 9	+ 3	70	+ 2	+ 8	10	
11	114	122	27	70	- 3	- 10	90	+ 12	- 8	120	- 22	+ 8	80	+ 12	- 9	120	- 22	+ 9	40	+ 6	- 2	175	- 17	- 14	30	+ 3	+ 1	70	+ 10	+ 3	70	+ 2	+ 9	11	
12N	114	122	27	90	- 6	- 13	95	+ 12	- 10	120	- 22	+ 8	90	+ 13	- 10	130	- 24	+ 8	60	+ 10	- 6	190	- 17	- 14	30	+ 3	+ 2	70	+ 9	- 2	85	+ 11	- 4	12N	
1P	115	120	21	70	- 15	- 4	70	+ 10	- 6	100	- 18	+ 4	100	+ 15	- 8	110	- 20	+ 4	60	+ 10	+ 4	150	- 16	- 10	30	+ 3	+ 2	60	+ 8	+ 1	50	+ 11	- 5	1P	
2	114	122	24	70	- 10	- 9	80	+ 11	- 7	105	- 18	+ 6	90	+ 14	- 8	110	- 20	+ 6	60	+ 11	+ 4	160	- 14	- 11	20	+ 2	+ 1	60	+ 8	- 2	60	+ 3	+ 7	2	
3	115	120	24	70	- 10	- 10	85	+ 12	- 8	105	- 20	+ 7	85	+ 14	- 10	105	- 21	+ 6	45	+ 7	+ 4	160	- 16	- 12	20	+ 2	+ 1	75	+ 10	+ 1	65	+ 1	+ 8	3	
4	114	121	24	65	- 8	- 10	80	+ 11	- 7	105	- 19	+ 7	100	+ 13	- 10	110	- 20	+ 8	5	- 1	+ 5	160	- 16	- 12	30	+ 3	0	70	+ 9	+ 3	65	+ 2	+ 11	4	
5	115	120	22	190	- 38	+ 5	70	- 6	0	80	+ 11	- 7	90	- 6	0	40	+ 2	- 8	120	+ 31	- 1	135	- 17	- 11	60	- 1	+ 4	30	+ 7	+ 5	100	+ 12	- 1	5	
6	116	120	22	200	- 40	+ 6	60	- 10	+ 1	50	+ 5	- 8	55	- 9	+ 1	50	+ 5	- 8	80	+ 16	- 3	120	- 12	- 11	80	- 3	+ 6	50	0	+ 5	130	+ 16	- 3	6	
7	115	120	22	210	- 43	+ 8	60	- 10	+ 1	70	+ 8	- 10	70	- 12	+ 3	70	- 8	- 10	200	+ 48	- 3	130	- 12	- 10	75	- 2	+ 6	70	0	+ 6	120	+ 16	- 3	7	
8	115	121	26	200	- 40	+ 4	70	- 11	0	70	+ 8	- 10	90	- 14	+ 4	70	+ 8	- 10	210	+ 42	- 7	160	- 14	- 14	80	- 2	+ 6	45	+ 1	+ 6	110	+ 17	0	8	
9	116	121	24	200	- 40	+ 5	65	- 10	0	50	+ 2	- 8	60	- 10	+ 1	60	+ 6	- 10	200	+ 40	- 4	150	- 13	- 12	70	- 1	+ 6	45	+ 1	+ 6	100	+ 16	- 1	9	
10		121																					- 11												10	
11		121																					- 9												11	
12MN		120																					- 9												12MN	

INTEGRATING METERS

CIRCUIT		METER READINGS PRES	METER READINGS PREV	METER READINGS DIFF	METER READINGS CONST	MWH OUTPUT TODAY	MWH OUTPUT MONTH	MW. DEMAND TODAY	MW. DEMAND MONTH	MW. DEMAND YEAR	1st OF MO. READING
SUWANNEE SW. 961	+MWH	00464	00454	10	1000	10	16	7	7	7	00448
	-MWH	77120	76542	578	"	578	10357	49	49	64	66763
	+MVARH	84717	84623	94	"	94	1715	10	12	19	83052
	-MVARH	10210	10102	98	"	98	504	22	22	26	09496
JASPER WEST SW. 955	+MWH	35612	35508	104	"	104	444	16	16	16	35168
	-MWH	01882	01685	197	"	197	4156	17	28	30	92226
	+MVARH										
	-MVARH										
INGLIS WEST SW. 954	+MWH	43532	43478	109	"	109	2248	12	18	32	41324
	-MWH	77561	72393	166	"	166	1013	25	25	26	76548
	+MVARH										
	-MVARH										
JASPER EAST SW. 952	+MWH	09422	09318	104	"	104	454	18	18	18	08968
	-MWH	38696	38502	194	"	194	4118	17	23	30	38578
	+MVARH	33962	33923	39	"	39	916	5	6	12	33052
	-MVARH	18486	12402	84	"	84	625	15	15	16	12761
INGLIS EAST SW. 953	+MWH	11212	11104	108	"	108	2223	12	19	24	08989
	-MWH	19401	18236	165	"	165	1014	26	26	26	18375
	+MVARH	01604	01539	65	"	65	2118	15	15	15	01356
	-MVARH	42368	42210	158	"	158	3119	13	17	27	39220
SILVER SPGS. SW. 991	+MWH	62615	62031	584	"	584	11222	43	48	58	51393
	-MWH	01084	01077	7	"	7	14	5	5	5	01070
	+MVARH	02646	02617	29	"	29	192	7	8	8	02454
	-MVARH	24478	24419	59	"	59	1367	6	9	9	23211

CIRCUIT		METER READINGS PRES	METER READINGS PREV	METER READINGS DIFF	METER READINGS CONST	MWH OUTPUT TODAY	MWH OUTPUT MONTH	MW. DEMAND TODAY	MW. DEMAND MONTH	MW. DEMAND YEAR	1st OF MO. READING
TRANSF. 110/66 KV SW. 364	+MWH	00387	00387	0	1000	0	0	0	0	0	00387
	-MWH	32307	32024	283	"	283	3954	17	17	20	28353
	+MVARH	10666	10666	0	"	0	0	0	0	12	10664
	-MVARH	09810	09512	298	"	298	5002	15	17	23	04908
DRIFTON SW. 363	+MWH	62943	62908	35	"	35	157	5	5	7	62796
	-MWH	91237	91172	65	"	65	1047	7	7	16	90190
	+MVARH										
	-MVARH										
JASPER SW. 352	+MWH	91715	91639	76	"	76	323	11	11	11	91342
	-MWH	32499	32477	17	"	17	464	2	6	10	31890
	+MVARH										
	-MVARH										
HIGH SPGS. SW. 350	+MWH	64575	64327	248	"	248	4980	20	21	29	59634
	-MWH	03824	03820	0	"	0	1	0	1	1	03823
	+MVARH										
	-MVARH										

TRANSF. TEMP. DEG. C.

TIME	115/69 3 PH	69/12 KV 1	2	3
8A	52	43	43	43
12N	55	46	46	45
4P	57	46	46	45

WEATHER

TIME	TEMP	CLEAR, CLOUDY, RAIN, LTNG
8A	78	X
4P	82	X

+ INDICATES OUT

- INDICATES IN

OPERATION CO

	READINGS PRES	READINGS PREV	TODA
SW. 350	54486	54486	
352	76485	76485	
363	46262	46262	
364	44040	44040	
951	30404	30404	
952	30101	30101	
953	51414	51414	
954	8720	8720	
955	67826	67826	
A-20	44022	44022	
BANK	43819	43782	3
961	3174	3177	
991	26151	26151	
956	188	188	

8-17-64

FORT WHITE SUBSTATION
DAILY OPERATING REPORT

Hearing Exhibit No. 33 (1123)

DAY Monday DATE 8-17 1964

TRANSMISSION LINES										TRANSFORMER			66 KV. TRANSMISSION LINES									TIME	REMARKS: SWITCHING, RELAY TARGETS, UNUSUAL CONDITIONS.
954 CKT	JASPER SW. 952 EAST CIRCUIT			INGLIS SW. 953 EAST CIRCUIT			SILVER SPRINGS SW. 991			110/66 KV SW. 364			DRIFTON SW. 363			JASPER SW. 352			HIGH SPRINGS SW. 350				
MVAR	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	E.S.T.	
											- 7												1A	954 open 1 Time 10:20 AM LE in DENS Reclose
											- 7												2	955 open 2 Time Phase Symbol Phase Relay Target
											- 8												3	
											- 7												4	
											- 6												5	
											- 7												6	
- 7	50	- 8	0	25	+ 3	- 7	160	+ 26	- 2	120	- 9	- 11	60	- 2	+ 5	60	- 1	+ 8	120	+ 15	- 14	7	
- 10	100	- 16	- 5	30	+ 5	- 10	200	+ 40	- 6	140	- 10	- 14	70	- 2	+ 6	70	- 3	+ 8	120	+ 15	- 3	8	
- 6	25	- 4	0	20	0	- 6	130	+ 26	- 2	150	- 12	- 14	60	- 1	+ 5	50	+ 3	+ 6	100	+ 12	+ 1	9	
+ 12	90	+ 14	- 10	130	- 22	+ 12	40	- 6	+ 2	170	- 14	- 14	30	+ 3	+ 1	70	+ 9	+ 3	70	+ 2	+ 8	10	
+ 8	80	+ 12	- 9	120	- 22	+ 9	40	+ 6	- 2	175	- 17	- 14	30	+ 3	+ 1	70	+ 10	+ 3	70	+ 2	+ 9	11	
+ 7	90	+ 13	- 10	130	- 24	+ 8	60	+ 10	+ 6	180	- 17	- 14	30	+ 3	+ 2	70	+ 9	- 2	80	+ 3	+ 9	12N	
+ 4	100	+ 15	- 3	110	- 20	+ 4	60	+ 10	+ 4	150	- 14	- 10	30	+ 3	+ 2	60	+ 8	+ 1	50	+ 4	+ 5	1P	
+ 6	90	+ 14	- 6	110	- 20	+ 6	60	+ 11	+ 4	160	- 14	- 11	20	+ 2	+ 1	60	+ 8	+ 3	60	+ 3	+ 7	2	
+ 7	85	+ 14	- 12	100	- 21	+ 6	45	+ 7	+ 4	160	- 16	- 12	20	+ 2	+ 1	25	+ 10	+ 7	65	+ 1	+ 8	3	
+ 7	100	+ 15	- 10	110	- 20	+ 9	5	+ 1	+ 5	160	- 16	- 12	30	+ 3	0	70	+ 9	+ 3	65	+ 2	+ 11	4	
- 7	70	- 5	0	110	+ 2	- 8	120	+ 24	- 1	135	- 11	- 11	60	- 1	+ 4	30	+ 7	+ 5	100	+ 12	- 1	5	
- 8	55	- 9	+ 1	70	+ 5	- 6	180	+ 36	- 3	120	- 12	- 11	80	- 3	+ 6	50	0	+ 5	130	+ 16	- 3	6	
- 10	70	- 12	+ 3	70	+ 8	- 10	200	+ 40	- 3	130	- 12	- 10	75	- 2	+ 6	70	0	+ 6	130	+ 16	- 3	7	
- 10	80	- 14	- 14	70	+ 8	+ 10	210	+ 42	- 7	160	- 14	- 14	80	- 2	+ 6	85	+ 1	+ 6	110	+ 17	0	8	
+ 8	60	- 10	+ 1	60	+ 6	- 10	200	+ 40	- 11	150	- 13	- 12	70	- 1	+ 6	85	+ 1	+ 6	100	+ 15	- 1	9	
											- 11												10	
											- 9												11	
											- 8												12MN	

INTEGRATING METERS

DEMAND MONTH	DEMAND YEAR	1st OF MO. READING	CIRCUIT		METER READINGS PRES	METER READINGS PREV	METER READINGS DIFF	METER READINGS CONST	MWH OUTPUT TODAY	MWH OUTPUT MONTH	MW. DEMAND TODAY	MW. DEMAND MONTH	MW. DEMAND YEAR	1st OF MO. READING
7	7	00448	TRANSF. 110/66 KV SW. 364	+MWH	00387	00387	0	1000	0	0	0	0	4	00387
49	64	66763		-MWH	32307	32024	283	"	283	3954	17	17	20	28353
12	19	23002		+MVARH	10666	10666	0	"	0	0	0	0	12	10666
22	26	09496		-MVARH	09810	09512	298	"	298	5002	15	17	22	04808
16	16	35168	DRIFTON SW. 363	+MWH	62943	62908	35	"	35	157	5	5	7	62796
28	30	92226		-MWH	91237	91172	65	"	65	1047	7	7	16	90190
				+MVARH										
				-MVARH										
18	32	41324	JASPER SW. 352	+MWH	91715	91639	76	"	76	373	11	11	11	91342
25	26	76548		-MWH	32491	32477	17	"	17	604	2	6	10	31790
				+MVARH										
				-MVARH										
18	18	02968	HIGH SPGS. SW. 350	+MWH	64575	64327	248	"	248	4940	20	21	29	59635
23	30	36578		-MWH	63824	03828	0	"	0	1	0	1	1	03823
6	12	33052		+MVARH										
15	16	12761		-MVARH										
19	24	09979												
26	26	18295												
15	15	03506												
17	27	39226												
48	58	51393												
5	5	01020												
8	8	02454												
9	9	23211												

OPERATION COUNTERS

SW.	READINGS PRES	READINGS PREV	OPERATIONS TODAY	OPERATIONS MONTH	OPERATIONS YEAR
350	500	500		1	29
352	765	765		1	14
363	462	462		1	16
364	440	440		1	10
951	304	304		1	7
952	301	301		1	12
953	514	514		3	18
954	870	870	1	5	18
955	678	676	2	4	17
A-20	402	402		5	38
BANK	43819	43782	37	427	7200
961	314	317		1	6
991	261	257		1	13
956	188	188		1	12

TRANSF. TEMP. DEG. C.

	115/69	69/12 KV		
TIME	3 PH	1	2	3
8A	52	43	43	43
12N	55	46	45	45
4P	57	46	46	45

WEATHER

TIME	TEMP	CLEAR, CLOUDY, RAIN, LTNG
8A	78	X
4P	82	X

+ INDICATES OUT
- INDICATES IN

REV. 2-28-61

OPERATOR	ON DUTY	OFF DUTY
Jo Kinsey	7Am	2Pm
Fred Hardy	2Pm	12Mn

FLORIDA POWER CORPORATION

JASPER SUBSTATION
DAILY OPERATING REPORT

DAY Wednesday DATE 7-8-64 19

7/8/64 7/8/64 7/8/64

115 KV TRANSMISSION LINES

TIME E.S.T.	BUSES VOLTAGE 115KV	69KV	BANK TAP	FT. WHITE - EAST SW. 46 AMP	MW	MVAR	KETTLE CREEK SW. 282 AMP	MW	MVAR	OUT METER	OUT MWH	IN METER	IN MWH	FT. WHITE - WEST SW. 457 AMP	MW	MVAR	SUWANNEE SW. 466 AMP	MW	MVAR	PINE GROVE SW. 452 AMP	MW	MVAR	OUT METER	OUT MWH	IN METER	IN MWH
1A	115	114						-7													-2						
2	115	114						-6													-11						
3	116	113						-6													-9						
4	116	114						-6													-8						
5	116	112						-6													-7						
6	116	114						-7													-11						
7	116	113	7	40	+7	-4	5	-1	-1	78515		91564		26	+6	-2	85	-14	+10	40	-5	+5	03634		33932	
8	116	113	7	55	+16	-4	10	-3	0	15	0	46	2	43	12	-2	100	-19	+9	50	-6	+6	24	0	38	4
9	114	113	8	53	+11	-4	5	-2	+1	15	0	47	1	26	+12	-2	95	-20	+7	50	-6	+8	24	0	43	5
10	114	114	9	50	+16	-3	5	-2	+1	15	0	49	2	56	12	-1	85	-17	-1	53	-5	+9	24	0	49	6
11	114	114	9	40	-2	+5	10	+20	-6	33	18	49	0	55	-7	+3	100	-21	-1	116	+21	-1	90	16	49	6
12N	114	114	1	55	-2	+6	38	+16	-6	50	19	49	0	40	-6	+3	100	-20	0	85	+15	+1	03705	16	49	6
1P	115	114	2	40	-6	+5	55	+24	-6	44	14	49	0	16	-4	+2	90	-18	+2	96	+16	+6	26	14	49	6
2	114	114	9	55	-10	+8	100	+19	-9	82	18	49	0	60	-8	+5	90	-18	-3	116	+21	-3	37	17	49	6
3	116	114						+26													+18						
4	115	114						+19													+15						
5	115	114						+16													+12						
6	114	115						-14													-8						
7	114	114						-10													-12						
8	113	114						-6													-11						
9	114	114						-1													-8						
10	115	114						-5													-12						
11	113	114						-10													-2						
12MN	114	114						-9																			

TRANSFORMER

TIME E.S.T.	115/69 KV SW. 461 AMP	MW	MVAR
1A		+3	
2		+4	
3		+3	
4		+3	
5		+2	
6		+4	
7	40	+3	-2
8	40	+3	-2
9	40	+4	-6
10	45	+4	-6
11	20	-1	-3
12N	30	+1	-4
1P	40	+1	-4
2	40	-1	-4
3		-1	
4		+1	
5		0	
6		+6	
7		+8	
8		+9	
9		+8	
10		+6	
11		+6	
12MN		+4	

69 KV TRANSMISSION LINES

TIME E.S.T.	FT. WHITE SW. 86 AMP	MW	MVAR	VALDOSTA SW. 78 AMP	MW	MVAR	OUT METER	OUT MWH	IN METER	IN MWH	WHITE SPRINGS SW. 86 AMP	MW	MVAR	OUT METER	OUT MWH	IN METER	IN MWH	CAP. BANK AMPS
1A																		
2																		
3																		
4																		
5																		
6																		
7	40	+2	-2	5	+1	C	14137		35224		5	C	C	68262		38630		
8	40	+3	-3	5	+1	0	38	1	24	0	5	0	-1	03	0	30	0	
9	40	+2	-2	5	+1	0	38	0	24	0	5	0	0	03	0	30	0	
10	35	+2	-2	5	+1	0	39	1	24	0	5	0	-1	03	1	30	0	
11	40	-3	-4	5	+1	0	40	1	24	0	5	0	0	03	0	30	0	
12N	30	-2	-4	5	+1	0	41	1	24	0	5	0	-1	03	0	30	0	
1P	40	-2	-5	5	+1	0	42	1	24	0	5	0	0	03	0	30	0	
2	40	-3	-4	5	+1	0	42	0	24	0	5	0	-1	04	1	30	0	
3												-1						
4												0						
5												0						
6												1						
7												5						
8												10						
9												9						
10												6						
11												0						
12MN												0						

CIRCUIT		METER READINGS PRES.	PREV.	DIFF.	CONST	MWH OUTPUT TODAY	MONTH	MW DEMAND TODAY	MONTH	YEAR
FT. WHITE - EAST SW. 46	+ MWH	25196	25137	209	1000	209	1983	15	17	27
	- MWH	11212	11163	49	"	49	386	12	16	16
KETTLE CREEK SW. 282	+ MWH	26550	26615	135	"	135	2617	10	19	124
	- MWH	91934	91886	113	"	103	1171	11	11	23
	+ MVARH	42269	42255	34	"	34	414	14	4	13
	- MVARH	12834	12887	50	"	52	121	19	12	12
FT. WHITE - WEST SW. 457	+ MWH	33925	33718	207	"	207	1926	17	12	11
	- MWH	11256	11257	49	"	49	88	12	12	14
SUWANNEE SW. 466	+ MWH	37686	37678	8	"	8	0	0	0	0
	- MWH	23770	23246	411	"	426	3131	23	14	49
	+ MVARH	42265	41955	115	"	116	1613	11	12	21
	- MVARH	8601	8581C	3	"	3	93	3	4	16
PINE GROVE SW. 452	+ MWH	03634	03434	120	"	120	2550	22	22	65
	- MWH	34033	33838	165	"	145	1521	12	15	42
	+ MVARH	46734	46598	139	"	139	1536	13	13	37
	- MVARH	13631	13634	2	"	2	2	14	4	11
TRANSF. BANK SW. 461	+ MWH	23424	23369	55	"	55	1559	13	17	37
	- MWH	08268	08264	4	"	4	4	1	1	1
	+ MVARH	76776	76776	0	"	0	1	0	0	1
	- MVARH	02355	02178	157	"	157	1477	11	10	15
FT. WHITE - 69KV SW. 86	+ MWH	06537	06489	50	"	50	193	5	5	12
	- MWH	66965	66955	16	"	16	45	4	1	6
VALDOSTA SW. 78	+ MWH	96154	96138	16	"	16	124	1	1	1
	- MWH	35224	35224	0	"	0	0	0	0	0
	+ MVARH	03308	03358	2	"	2	16	1	1	1
	- MVARH	49346	49346	0	"	0	3	0	0	0

CIRCUIT		METER READINGS PRES	PREV	DIFF.	CONST	MWH OUTPUT TODAY	MONTH	MW DEMAND TODAY	MONTH	YEAR
W. SPRINGS SW. 86	+ MWH	68703	68587	6	1000	6	876	5	25	25
	- MWH	25830	25830	0	"	0	0	0	0	0
	+ MVARH	81702	81702	0	"	0	3	0	2	1
	- MVARH	25545	25545	4	"	7	159	0	4	4
	+ MWH									
	- MWH									
	+ MVARH									
	- MVARH									

CIRCUIT BREAKER OPERATIONS

SW No.	READINGS PRES	PREV	OPERATIONS TODAY	MONTH	YEAR
46	4433	4433	0	1	2
86	12774	12774	0	3	57
78	716	716	0	0	4
86	6482	6489	0	1	5
231	14461	14461	0	0	12
282	4466	4466	0	0	2
457	8311	8311	0	1	12
466	7226	7226	0	0	1
452	4136	4136	0	0	6
461	3000	3000	0	0	6
468	5700	5700	0	1	12
A-B	5611	5611	0	1	39
TAP CHG.	22722	22724	8	114	4109

TRANSFORMER DEG. C.

TIME	115/69 3 PH.	69/12 KV 1	2	3
8A	45	45	45	45
12N	46	50	50	50
4P				
8P				

WEATHER

TIME	TEMP.	CLEAR, CLOUDY, RAIN, LTNG.
8A	47°F	✓
4P		

REMARKS: LIST ALL SWITCHING, RECORD SWITCH OPERATIONS, RELAY TARGETS, LIST ALL LONG DISTANCE CALLS OTHER THAN THOSE MADE BY SUBSTATION OPERATOR:

10:57 AM Carrier OK to Quincy

OPERATOR	ON DUTY	OFF DUTY
Anderson	7am	3pm

OD-31C REV. 4-59

FLORIDA POWER CORPORATION

JASPER SUBSTATION
DAILY OPERATING REPORT

TIME E.S.T.	BUSES VOLTAGE 115KV		BANK TAP	115 KV TRANSMISSION LINES: FT. WHITE - EAST SW. 46 AMP	MW	MVAR	KETTLE CREEK SW. 282 AMP	MW	MVAR	OUT METER	OUT MWH	IN METER	IN MWH	FT. WHITE - WEST SW. 437 AMP	MW	MVAR	SUWANNEE SW. 466 AMP	MW	MVAR	PINE GROVE SW. 452 AMP	MW	MVAR	OUT METER	OUT MWH	IN METER	IN MWH	TRANSFORMER 115/69 KV SW. 461 AMP	MW	MVAR
1A	115	114						-8													-11							+4	
2	116	113						-8													-9							+4	
3	116	113						-9													-10							+4	
4	116	113						-11													-12							+3	
5	116	113						-9													-13							+3	
6	115	113						-7													-10							+4	
7	114	114	8	20	+14	-5	12	-10	+4	32491		96163		75	+13	-3	55	-16	+4	50	-14	+8	06820		39667		45	+5	-7
8	116	118	8	65	+12	-6	40	-5	+3	91	0	68	5	45	+8	-3	55	-16	+3	45	-7	+9	20	0	24	7	40	+4	-6
9	115	118	8	20	+4	-1	45	+4	0	91	0	10	2	10	+5	-1	90	-19	+1	50	+1	+5	20	0	25	4	30	+3	-5
10	114	114	9	60	-10	+4	112	+16	-6	82505	14	10	0	55	-9	+3	135	-28	-1	75	+14	+1	30	10	25	0	80	+15	-5
11	114	115	16	85	-14	+9	100	+19	-8	23	15	15	0	80	-12	+5	130	-25	-6	90	+17	0	46	16	28	0	75	+14	-3
12N	113	115	10	85	-14	+9	96	+18	-8	43	20	10	0	75	-12	+5	125	-24	-6	90	+12	+2	15	19	28	0	75	+13	-4
1P	115	114	8	30	-7	+4	96	+18	-8	58	15	10	0	30	-5	+3	100	-20	0	50	+15	+3	50	15	28	0	20	-1	-4
2	115	114	9	30	-6	+4	96	+17	-7	75	18	10	0	20	-7	+2	100	-21	-2	80	+15	+1	47	17	28	0	20	-1	-3
3	105	114	8	5	-3	+3	80	+15	-5	93	18	10	0	5	-3	+3	110	-21	-1	70	+13	+3	06914	17	26	0	10	0	-5
4	115	113	8	5	-3	+3	50	+10	-6	82607	14	10	0	5	-1	+1	105	-19	+2	55	+9	+3	27	13	28	0	10	+1	-5
5	114	113	8	50	+9	-3	70	-3	0	16	11	10	0	60	+11	-1	115	-22	0	85	-11	+12	36	11	26	0	50	+6	-7
6	115	113	8	80	+16	-5	30	-5	0	16	0	24	10	80	+13	-3	125	-24	+4	70	-8	+11	36	0	40	12	50	+6	-7
7	114	113	8	70	+13	-5	40	-7	+2	18	4	27	7	80	+14	-2	105	-21	+1	80	-11	+12	36	0	39200	10	50	+6	-7
8	115	113	8	90	+17	-7	60	-11	+5	18	0	36	11	80	+14	-2	110	-21	0	80	-12	+12	36	0	13	13	50	+7	-7
9	115	114	8	90	+16	-8	60	-10	+6	18	0	47	9	80	+13	-3	100	-20	0	90	-13	+13	36	0	24	11	55	+7	-7
10	115	114						-9													-11							+2	
11	113	114						-10													-10							+5	
12MN	114	114						-16													-12							+6	

TIME E.S.T.	69 KV TRANSMISSION LINES: FT. WHITE SW. 86 AMP	MW	MVAR	VALDOSTA SW. 75 AMP	MW	MVAR	OUT METER	OUT MWH	IN METER	IN MWH
1A										
2										
3										
4										
5										
6										
7	75	+4	-7	5	+1	0	96682		35224	
8	66	+2	-7	5	+1	0	82	0	24	0
9	55	+1	-6	5	+1	0	83	1	24	0
10	45	-5	-7	5	+1	0	84	1	24	0
11	55	-7	-2	5	+1	0	84	0	24	0
12N	55	-6	-2	5	+1	0	85	1	24	0
1P	50	-2	-5	5	+1	0	86	1	24	0
2	30	-2	-4	5	+1	0	86	0	24	0
3	30	-1	-5	5	+1	0	87	1	24	0
4	52	-1	-5	5	+1	0	87	0	24	0
5	75	+4	-6	5	+1	0	88	1	24	0
6	80	+4	-6	5	+1	0	89	1	24	0
7	85	+5	-9	5	+1	0	90	1	24	0
8	85	+5	-9	5	+1	0	91	1	24	0
9	85	+5	-7	5	+1	0	94	1	24	0
10										
11										
12MN										

CIRCUIT		METER READINGS PRES.	PREV.	DIFF.	CONST.	MWH OUTPUT TODAY	MONTH	MW DEMAND TODAY	MONTH	YEAR
FT. WHITE - EAST SW. 46	+ MWH	33256	32528	728	1000	224	31349	15	02	07
	- MWH	12150	11788	62	"	62	2349	14	14	14
KETTLE CREEK SW. 282	+ MWH	51615	82491	127	"	127	12049	06	06	51
	- MWH	262 35	96108	127	"	127	13994	02	14	22
	+ MVARH	62645	62575	45	"	45	5644	6	7	13
	- MVARH	17285	14236	51	"	51	5396	12	12	17
FT. WHITE - WEST SW. 437	+ MWH	34221	34045	216	"	226	31054	03	03	31
	- MWH	18345	18163	63	"	63	2334	16	16	16
SUWANNEE SW. 466	+ MWH	57655	57658	0	"	0	5446	0	0	0
	- MWH	39583	39167	415	"	416	5746	03	03	49
	+ MVARH	46667	46564	73	"	73	17334	10	12	32
	- MVARH	86715	86903	12	"	12	1247	1	1	16
PINE GROVE SW. 452	+ MWH	06933	06820	116	"	116	16634	09	14	15
	- MWH	39356	39194	162	"	162	2337	13	15	27
	+ MVARH	54236	54069	169	"	169	26834	15	15	31
	- MVARH	03746	03744	2	"	2	2912	2	3	5
TRANSF. BANK SW. 461	+ MWH	27522	27383	139	"	139	14654	12	19	27
	- MWH	08762	08760	2	"	2	641	1	1	2
	+ MVARH	76731	76791	0	"	0	0	0	6	18
	- MVARH	02372	02372	160	"	160	1941	10	10	16
FT. WHITE - 69KV SW. 86	+ MWH	85452	85403	54	"	54	7334	06	12	12
	- MWH	17365	17337	31	"	31	1124	7		
VALDOSTA SW. 75	+ MWH	46682	46682	15	"	15	1814	1	1	1
	- MWH	35724	35724	0	"	0	0	0	0	0
	+ MVARH	02345	02345	0	"	0	1234	0	1	1
	- MVARH	49153	49052	1	"	1	3	0	1	1

CIRCUIT		METER READINGS PRES.	PREV.	DIFF.	CONST.	MWH OUTPUT TODAY	MONTH	MW DEMAND TODAY	MONTH	YEAR
W. SPRINGS SW. 56	+ MWH	69661	69590	71	1000	71	3134	19	19	16
	- MWH	25630	25630	0	"	0	0	0	0	0
	+ MVARH	81713	81713	0	"	0	1	0	0	2
	- MVARH	35330	35905	25	"	25	131	5	5	6
	+ MWH									
	- MWH									
	+ MVARH									
	- MVARH									

CIRCUIT BREAKER OPERATIONS

SW No.	READINGS PRES.	PREV.	OPERATIONS TODAY	MONTH	YEAR
46	4094	894	0	1 ✓	9 ✓
56	1786	1786	0	1 ✓	15 ✓
75	716	716	0	0 ✓	0 ✓
86	693	693	0	0 ✓	12 ✓
231	1943	1942	0	1 ✓	20 ✓
282	441	441	0	1 ✓	4 ✓
437	631	631	0	0 ✓	12 ✓
438	727	727	0	1 ✓	8 ✓
452	437	437	0	1 ✓	7 ✓
461	301	301	0	1 ✓	7 ✓
466	576	576	0	0 ✓	12 ✓
A-5	561	561	0	0 ✓	29 ✓
TAP CHG.	12704	12694	10	114 ✓	4681 ✓

TRANSFORMER DEG. C.

TIME	115/69 3 PH.	69/12 KV 1	2	3
8A	45	45	45	45
12N	45	50	45	45
4P	45	45	45	45
8P	45	45	45	45

WEATHER

TIME	TEMP.	CLEAR, CLOUDY, RAIN, LTNG.
8A	40°F	✓
4P	60°F	✓

REMARKS: LIST ALL SWITCHING, RECORD SWITCH OPERATIONS, RELAY TARGETS

9:09 AM FP&L Tied in on White Springs 69KV Line
12:52 pm FP&L Cut Loose.
"
"

JASPER SUBSTATION
DAILY OPERATING REPORT

DAY Wednesday DATE 8-12-64 19__

115 KV TRANSMISSION LINES

	FT. WHITE - WEST SW. 437				SUWANNEE SW. 466			PINE GROVE SW. 452							TRANSFORMER 115/69 KV SW. 461			TIME E.S.T.
	IN MWH	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	OUT METER	OUT MWH	IN METER	IN MWH	AMP	MW	MVAR	
									-11							+4		1A
									-9							+4		2
									-10							+4		3
									-12							+3		4
									-13							+3		5
									-10							+4		6
2		75	+13	-3	85	-16	+4	50	-14	+8	06826		39667		45	+5	-7	7
3	5	45	+8	-3	55	-16	+3	45	-7	+9	20	0	24	7	40	+4	-6	8
4	2	10	+5	-1	40	-19	+1	50	+1	+8	20	0	25	4	30	+3	-5	9
5	6	55	-9	+3	35	-28	-1	75	+14	+1	30	10	75	0	80	+15	-5	10
6	0	80	-12	+5	30	-25	-6	90	+17	0	46	16	78	0	75	+14	-3	11
7	0	75	-12	+5	35	-24	-6	90	+17	+2	45	13	75	0	75	+13	-4	12N
8	0	30	-5	+3	100	-20	0	80	+15	+3	50	15	78	0	30	-1	-4	1P
9	0	20	-2	+2	100	-21	-2	80	+15	+1	47	17	78	0	25	-1	-3	2
10	0	5	-3	+3	110	-21	-1	70	+13	+3	06914	17	76	0	10	0	-5	3
11	0	5	-1	+1	100	-19	+1	55	+9	+3	27	13	78	0	10	+1	-5	4
12	0	60	+11	-1	115	-22	0	85	+11	+12	36	11	76	0	50	+6	-7	5
1	10	80	+13	-3	125	-24	+4	70	-6	+11	36	0	90	12	50	+6	-7	6
2	1	80	+14	-2	105	-21	+1	80	-11	+12	36	0	39700	10	50	+6	-7	7
3	11	80	+14	-2	110	-21	0	80	-12	+12	36	0	13	13	50	+7	-7	8
4	9	80	+13	-3	105	-20	0	90	-13	+13	36	0	24	11	55	+7	-7	9
									-11							+7		10
									-10							+5		11
									-12							+6		12MN

69 KV TRANSMISSION LINES

	FT. WHITE SW. 86			VALDOSTA SW. 75							WHITE SPRINGS SW. 56							CAP. BANK
	AMP	MW	MVAR	AMP	MW	MVAR	OUT METER	OUT MWH	IN METER	IN MWH	AMP	MW	MVAR	OUT METER	OUT MWH	IN METER	IN MWH	AMPS
1A												0						
2												0						
3												0						
4												0						
5												0						
6												0						
7	75	+4	-7	5	+1	0	96682		35224		5	0	0	48590		38630		
8	65	+2	-7	5	+1	0	82	0	24	0	5	0	-1	90	0	30	0	
9	55	+1	-6	5	+1	0	83	1	24	0	5	0	0	91	1	30	0	
10	45	-5	-7	5	+1	0	84	1	24	0	450	+18	-4	69604	15	30	0	
11	55	-7	-2	5	+1	0	84	0	24	0	450	+19	-3	24	15	30	0	
12N	55	-6	-2	5	+1	0	85	1	24	0	150	+18	-4	44	20	30	0	
1P	50	-2	-5	5	+1	0	86	1	24	0	5	0	0	57	13	30	0	
2	30	-2	-4	5	+1	0	86	0	24	0	5	0	-1	58	1	30	0	
3	35	-1	-5	5	+1	0	87	1	24	0	5	0	0	58	0	30	0	
4	50	-1	-5	5	+1	0	87	0	24	0	5	0	-1	58	0	30	0	
5	75	+4	-6	5	+1	0	88	1	24	0	5	0	0	58	0	30	0	
6	80	+4	-6	5	+1	0	89	1	24	0	5	0	-1	59	1	30	0	
7	85	+5	-9	5	+1	0	90	1	24	0	5	0	0	59	0	30	0	
8	85	+5	-9	5	+1	0	91	1	24	0	5	0	-1	59	0	30	0	
9	85	+5	-7	5	+1	0	92	1	24	0	5	0	0	59	0	30	0	
10												0						
11												0						
12MN												0						

DEMAND

MTH	YEAR
12	
14	
5/	
12	
13	
17	
31	
16	
6	
29	
12	
16	
27	
21	
8	
17	
7	
28	
11	
17	
0	
1	

CIRCUIT		METER READINGS PRES.	PREV.	DIFF.	CONST.	MWH OUTPUT TODAY	MONTH	MW DEMAND TODAY	MONTH	YEAR
W. SPRINGS Sw. 56	+MWH	69661	69590	71	1000	71	3134	14	14	16
	-MWH	25630	25630	0	11	0	0	0	0	0
	+MVARH	81713	81713	0	11	0	1	0	0	1
	-MVARH	35930	35905	25	11	23	131	5	5	6
	+MWH									
	-MWH									
	+MVARH									
	-MVARH									

CIRCUIT BREAKER OPERATIONS

SW No.	READINGS PRES.	PREV.	OPERATIONS TODAY	MONTH	YEAR
46	4914	894	0	1	9
56	1946	1786	0	1	16
75	216	216	0	0	0
86	693	693	0	0	12
231	1942	1942	0	1	20
282	441	441	0	1	9
437	631	631	0	0	12
438	777	777	0	1	8
452	437	437	0	1	7
461	301	301	0	1	7
466	526	526	0	0	12
A-5	561	561	0	0	29
TAP CHG.	22704	22694	10	114	4687

TRANSFORMER DEG. C.

TIME	115/69 3 PH.	69/12 KV 1	2	3
8A	45	45	45	45
12N	45	50	45	45
4P	45	45	45	45
8P	45	45	45	45

WEATHER

TIME	TEMP.	CLEAR, CLOUDY, RAIN, LTNG.
8A	41°F	✓
4P	80°F	✓

REMARKS: LIST ALL SWITCHING, RECORD SWITCH OPERATIONS, RELAY TARGETS, LIST ALL LONG DISTANCE CALLS OTHER THAN THOSE MADE BY SUBSTATION OPERATOR:

9:09 AM FP+L Tied in on White Springs 69KV Line
12:52 pm FP+L Cut Loose.

OPERATOR	ON DUTY	OFF DUTY
Anderson	7am	2pm
Hunter	2pm	7pm

OD-31C REV. 4-59

FLORIDA POWER CORPORATION

JASPER SUBSTATION
DAILY OPERATING REPORT

TIME E.S.T.	BUSES VOLTAGE 115KV	BUSES VOLTAGE 69KV	BANK TAP	115 KV TRANSMISSION LINES — FT. WHITE - EAST SW. 46 AMP	MW	MVAR	KETTLE CREEK SW. 282 AMP	MW	MVAR	OUT METER	OUT MWH	IN METER	IN MWH	FT. WHITE - WEST SW. 437 AMP	MW	MVAR	SUWANNEE SW. 466 AMP	MW	MVAR	PINE GROVE SW. 452 AMP	MW	MVAR	OUT METER	OUT MWH	IN METER	IN MWH	TRANSFORMER 115/69 KV SW. 461 AMP	MW	MVAR	TIME E.S.T.	69 KV TRANSMISSION LI FT. WHITE SW. 86 AMP	MW	MVAR	VALDOSTA SW. 75 AMP	MW	MVAR	OUT METER	OUT MWH	IN METER	IN MWH
1A	114	114						-10													-12							+5		1A										
2	115	114						-8													-11							+5		2										
3	115	114						0													-2							+3		3										
4	115	114						-7													-10							+4		4										
5	115	113						-9													-12							+5		5										
6	116	113						-4													-9							+5		6										
7	115	113	7	40	+8	-3	5	+1	0	82913		96732		25	+6	-1	100	-19	+6	35	-3	+5	07214		40509		40	+3	-6	7	75	+3	-6	5	+1	0	96753		35774	
8	115	113	8	90	+16	-6	40	-5	+5	14	1	26	4	80	+12	-3	130	-25	+3	70	-8	+11	14	0	16	7	40	+5	-7		60	+4	-7	5	+1	0	54	1	74	0
9	113	113	9	30	+5	-3	5	0	+1	14	0	29	3	5	+5	-1	145	-29	-1	40	-1	+7	14	0	24	8	115	+20	-6		50	-1	-4	5	+1	0	55	1	74	0
10	113	115	9	85	-14	+10	100	+19	-5	32	16	39	0	75	-12	+6	130	-24	-6	80	+14	+3	31	17	24	0	85	+16	-11		30	-5	-3	5	+1	0	55	0	74	0
11	113	115	10	80	-14	+5	90	+20	-5	57	20	29	0	75	-14	+5	150	-28	-7	85	+15	+3	49	18	24	0	120	+19	-9		20	-6	-3	5	+1	0	56	1	74	0
12N	113	115	10	90	-15	+10	120	+21	-8	74	20	29	0	80	-13	+7	170	-33	-7	90	+16	+1	66	19	24	0	115	+20	-9		65	-6	-3	5	+1	0	57	1	74	0
1P	114	116	8	60	-11	+5	120	+22	-10	93	21	29	0	60	-10	+4	195	-34	+7	90	+16	0	86	18	24	0	110	+17	-9		50	-4	-2	5	+1	0	57	0	74	0
2	113	115	10	50	-11	+6	120	+23	-8	53013		29	0	70	-12	+4	190	-36	+3	90	+17	0	07303	17	24	0	120	+21	-6		60	-5	-2	5	+1	0	58	1	74	0
3	113	114	10	50	-14	+3	134	+24	-10	35	22	29	0	75	-13	+4	100	-35	+1	100	+24	-1	13	20	24	0	90	+17	-4		60	-6	-2	5	+1	0	59	1	74	0
4	113	114	10	15	-14	+2	150	+26	-12	62	26	29	0	20	-12	+4	196	-38	+1	115	+24	-1	46	43	24	0	75	+14	-2		55	-5	-3	5	+1	0	60	1	74	0
5	115	115	9	20	-5	+2	70	+14	-7	87	25	29	0	16	-4	+1	190	-35	+5	15	+12	+4	65	22	24	0	95	+16	-4		65	-2	-4	5	+1	0	61	1	74	0
6	114	115	9	100	+1	-2	20	+2	-9	98	1	30	1	140	+2	-2	205	-40	+11	50	-6	+5	68	0	36	6	170	+22	-6		45	+1	-4	5	+1	0	61	0	74	0
7	114	114	9	65	+13	-5	30	-5	-1	85	0	34	3	70	+12	-2	200	-40	+13	65	-10	+8	68	0	38	6	130	+24	-6		50	+2	-4	5	+1	0	62	1	74	0
8	113	115	10	50	+10	-4	10	-1	-2	88	0	37	4	60	+10	-1	195	-39	+6	65	-10	+8	68	0	50	12	135	+25	-6		45	+2	-4	5	+1	0	63	1	74	0
9	114	115	9	30	+12	-6	40	-6	+1	88	0	44	7	35	+10	-2	195	-39	+5	160	-12	+12	68	0	62	12	135	+24	-7		55	+3	-5	5	+1	0	64	1	74	0
10	115	114						-8													-14							+23		10										
11	116	115						-6													-9							+6		11										
12MN	114	114						-7													-9							+5		12MN										

CIRCUIT		METER READINGS PRES.	PREV.	DIFF.	CONST.	MWH OUTPUT TODAY	MONTH	MW DEMAND TODAY	MONTH	YEAR
FT. WHITE - EAST SW. 46	+ MWH	35004	34793	211	1000	211 ✓	4367	16	22	27
	- MWH	12366	12216	150	"	150 ✓	450	15	15	15
KETTLE CREEK SW. 282	+ MWH	83088	82914	174	"	174 ✓	1674	28	28	31
	- MWH	96803	96726	77	"	77 ✓	2117	80	14	22
	+ MVARH	62890	62870	20	"	20 ✓	814	4	6	13
	- MVARH	64486	64414	74	"	74 ✓	740	12	12	17
FT. WHITE - WEST SW. 437	+ MWH	35508	35299	209	"	209 ✓	4342	17	23	31
	- MWH	18961	18857	104	"	104 ✓	449	16	16	18
SUWANNEE SW. 466	+ MWH	57655	57658	0	"	0 ✓	0	0	0	0
	- MWH	91852	91245	607	"	607 ✓	6015	40	40	49
	+ MVARH	47261	47115	146	"	146 ✓	2392	11	12	22
	- MVARH	86945	86829	116	"	116 ✓	42	7	7	10
PINE GROVE SW. 452	+ MWH	07367	07214	153	"	153 ✓	1491	25	25	26
	- MWH	40661	40516	145	"	145 ✓	2962	16	18	27
	+ MVARH	55041	54945	146	"	146 ✓	2936	13	15	27
	- MVARH	03771	03763	8	"	8 ✓	56	2	3	8
TRANSF. BANK SW. 461	+ MWH	28245	27913	332	"	332 ✓	2188	27	27	27
	- MWH	08774	08774	0	"	0 ✓	18	0	2	2
	+ MVARH	76731	76731	0	"	0 ✓	0	0	0	18
	- MVARH	03469	03301	168	"	188 ✓	2763	11	11	16
FT. WHITE - 69KV SW. 86	+ MWH	68754	68716	38	"	38 ✓	1035	3	6	12
	- MWH	67466	67411	55	"	55 ✓	212	8	8	8
VALDOSTA SW. 75	+ MWH	96770	96754	16	"	16 ✓	254	0	1	1
	- MWH	35774	35774	0	"	0 ✓	0	0	0	0
	+ MVARH	02350	02348	2	"	2 ✓	17	0	0	1
	- MVARH	44952	44952	0	"	0 ✓	6	0	0	0

CIRCUIT		METER READINGS PRES.	PREV.	DIFF.	CONST.	MWH OUTPUT TODAY	MONTH	MW DEMAND TODAY	MONTH	YEAR
W. SPRINGS SW. 66	+ MWH	64984	64682	302	1000	302 ✓	636	25	25	26
	- MWH	28630	28630	0	"	0 ✓	0	0	0	0
	+ MVARH	81713	81713	0	"	0 ✓	1	0	0	2
	- MVARH	36024	35965	59	"	59 ✓	425	4	5	6
	+ MWH									
	- MWH									
	+ MVARH									
	- MVARH									

CIRCUIT BREAKER OPERATIONS

SW. No.	READINGS PRES.	PREV.	OPERATIONS TODAY	MONTH	YEAR
46	494	494	0	1 ✓	9 ✓
56	1795	1787	8	10 ✓	74 ✓
75	710	710	0	0 ✓	6 ✓
86	694	694	0	1 ✓	13 ✓
231	1943	1942	1	2 ✓	21 ✓
282	441	441	0	1 ✓	9 ✓
437	831	831	0	0 ✓	12 ✓
466	777	777	0	1 ✓	8 ✓
452	437	437	0	1 ✓	7 ✓
461	301	301	0	1 ✓	7 ✓
466	570	570	0	0 ✓	12 ✓
A-5	561	561	0	0 ✓	29 ✓
TAP CHG.	22765	22750	15	175 ✓	4742 ✓

TRANSFORMER DEG. C.

TIME	115/69 3 PH.	69/12 KV 1	2	3
8A	45	45	45	45
12N	50	55	55	55
4P	55	59	55	55
8P				

WEATHER

TIME	TEMP.	CLEAR, CLOUDY, RAIN, LTNG.
8A	86°F	✓
4P	91°F	

REMARKS: LIST ALL SWITCHING, RECORD SWITCH OPERATIONS, RELAY TARGETS

6:46 AM Order # 1X comp 6:50 AM
8:49 AM Ha Piff tied in comping Live Oak
8:51 AM Order # 2X sig to Bay
9:22 AM OCB 23V closed
11:15 AM Lunny to Ft Wht
11:30 AM Lamar OK to St Petersburg
12:00 AM Lain report on 72 Hamilton open
12:42 PM OCB 56 Phase B+C Zone 1 Pilot + Co
2:16 PM CCB 56 Phase B+C Zone 1 pilot + C
2:31 PM CCB 23V Opened
3:02 PM CCB 56 phase A+B PILOT + Rec
3:10 PM CCB 56 phase B+C Zone 1 PILOT
3:17 PM CCB 56 phase A+B PILOT Rec
4:30 PM Order # 1X
4:33 PM Order # 2X

JASPER SUBSTATION
DAILY OPERATING REPORT

DAY Monday DATE 8-17-64 19

115 KV TRANSMISSION LINES

FT. WHITE - WEST SW. 437			SUWANNEE SW. 466			PINE GROVE SW. 452						
AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	OUT METER	OUT MWH	IN METER	IN MWH
							-12					
							-11					
							-2					
							-10					
							-12					
							-9					
25	+6	-1	100	-19	+6	35	-3	+5	07303-14		40509	
20	+12	-3	150	-25	+3	70	-6	+11	14	6	16	7
5	+5	-1	145	-29	-1	40	-1	+7	14	2	24	8
25	-12	+6	130	-24	-6	80	+14	+3	31	17	24	0
20	-14	+5	150	-28	-2	85	+15	+3	49	18	24	0
20	-13	+7	100	-32	-2	90	+16	+1	68	19	24	0
20	-10	+4	195	-34	+2	90	+16	0	86	18	24	0
20	-12	+4	120	-36	+3	90	+17	0	07303	17	24	0
20	-12	+4	100	-35	+1	100	+21	-1	13	24	14	0
20	-12	+5	180	-38	+1	115	+24	-1	46	4.3	24	0
20	-4	+1	190	-35	+.5	65	+12	+4	65	22	24	0
20	+2	-2	205	-40	+11	50	-6	+5	68	0	36	6
20	+12	-2	200	-40	+3	65	-10	+8	68	0	38	6
20	+10	-1	195	-37	+6	65	-10	+8	68	0	50	12
20	+14	-3	195	-39	+5	100	-12	+12	68	0	62	12
							-14					
							-9					
							-9					

TRANSFORMER

115/69 KV SW. 461		
AMP	MW	MVAR
	+5	
	+5	
	+3	
	+4	
	+5	
	+5	
40	+3	-6
40	+5	-7
115	+20	-6
115	+18	-11
120	+19	-9
115	+20	-9
110	+17	-9
120	+21	-6
90	+17	-4
35	+16	-2
95	+18	-4
120	+22	-6
130	+24	-6
135	+25	-6
135	+24	-7
	133	
	+6	
	+5	

69 KV TRANSMISSION LINES

TIME E.S.T.	FT. WHITE SW. 86			VALDOSTA SW. 75							WHITE SPRINGS SW. 56							CAP. BANK
	AMP	MW	MVAR	AMP	MW	MVAR	OUT METER	OUT MWH	IN METER	IN MWH	AMP	MW	MVAR	OUT METER	OUT MWH	IN METER	IN MWH	AMPS
1A												0						
2												0						
3												0						
4												0						
5												0						
6												0						
7	75	+3	-6	5	+1	0	96753		35774		5	0	0	69682		42630		
8	60	+4	-7	5	+1	0	54	1	74	0	5	0	-1	82	0	30	0	
9	50	-1	-4	5	+1	0	55	1	74	0	152	+14	-4	85	3	34	6	
10	70	-5	-3	5	+1	0	55	0	74	0	150	+20	-5	697 09	23	34	6	55
11	70	-6	-3	5	+1	0	56	1	74	0	150	+20	-4	33	15	34	6	55
12N	65	-6	-3	5	+1	0	57	1	74	0	150	+20	-4	57	24	34	6	55
1P	52	-4	-2	5	+1	0	57	0	74	0	150	+20	-4	82	23	30	6	55
2	60	-5	-1	5	+1	0	58	0	74	0	150	+19	-4	697 01	25	34	6	55
3	60	-6	-2	5	+1	0	59	1	74	0	150	+20	-6	36	25	30	0	
4	55	-5	-3	5	+1	0	60	1	74	0	150	+18	-2	49	14	30	6	
5	65	-2	-4	5	+1	0	61	1	74	0	150	+20	-3	68	14	30	6	
6	45	+1	-4	5	+1	0	61	0	74	0	150	+20	-3	70	12	30	0	
7	50	+2	-4	5	+1	0	62	1	74	0	150	+20	-3	697 16	24	30	6	
8	55	+2	-4	5	+1	0	63	1	74	0	150	+20	-4	33	24	30	0	
9	55	+3	-5	5	+1	0	64	1	74	0	150	+20	-3	55	22	30	0	
10												+18			2			
11												0						
12MN												0						

CIRCUIT		METER READINGS PRES.	PREV.	DIFF.	CONST.	MWH OUTPUT TODAY	MONTH	MW DEMAND TODAY	MONTH	YEAR
W. SPRINGS SW. 56	+MWH	69984	69682	302	1000	302	✓ 636	25	25	26
	-MWH	28630	28630	0	"	0	✓ 0	0	0	0
	+MVARH	81713	81713	0	"	0	✓ 1	0	0	2
	-MVARH	36027	35965	59	"	59	✓ 425	4	5	6
	+MWH									
	-MWH									
	+MVARH									
	-MVARH									

CIRCUIT BREAKER OPERATIONS

SW. No.	READINGS PRES.	PREV.	OPERATIONS TODAY	MONTH	YEAR
48	494	494	0	1 ✓	9 ✓
56	1795	1787	8	10 ✓	74 ✓
75	710	710	0	0 ✓	6 ✓
86	694	694	0	1 ✓	13 ✓
231	1943	1942	1	2 ✓	21 ✓
282	441	441	0	1 ✓	9 ✓
437	831	831	0	0 ✓	12 ✓
438	222	222	0	1 ✓	8 ✓
452	437	437	0	1 ✓	7 ✓
461	301	301	0	1 ✓	7 ✓
488	570	570	0	0 ✓	12 ✓
A-5	561	561	0	0 ✓	29 ✓
CAP BKS.	33245	33230	15	175 ✓	4742 ✓

TRANSFORMER DEG. C.

TIME	115/69 3 PH.	69/12 KV 1	2	3
8A	45	45	45	45
12N	50	55	55	55
4P	55	59	55	55
8P				

WEATHER

TIME	TEMP.	CLEAR, CLOUDY, RAIN, LTNG.
8A	86°F	✓
4P	91°F	

REMARKS: LIST ALL SWITCHING, RECORD SWITCH OPERATIONS, RELAY TARGETS, LIST ALL LONG DISTANCE CALLS OTHER THAN THOSE MADE BY SUBSTATION OPERATOR:

6:46 AM Order # 1X going 8:50 AM
6:49 AM Ha Pitt tied in carrying Live Oak + Lake City
8:51 AM Order # 2X in to Bay
9:22 AM OCB 231 closed
11:15 AM Living to H Wkt
11:30 AM Lynch OK to St Petersburg
12:40 PM Lewis reports on 72X Hamlin open
12:42 PM OCB 56 Phase B + C Zone 1 Pilot + Co DLR 1st + 2nd contact
2:16 PM OCB 56 Phase B + C Zone 1 pilot + Co DLR 1st + 2nd contact 2 Operations
2:31 PM OCB 231 Opened
3:02 PM OCB 56 Phase A + B PILOT Reclosed DLR 1 Operation
3:10 PM OCB 56 Phase A + B Zone 1 PILOT Dead Line 1st + 2nd CONTACT 2 Operation
3:17 PM OCB 56 Phase A + B PILOT Reclosed Dead Line Reclosed 1 Operation
4:30 PM Order # 2X [illegible] by Gage
4:33 PM Order # 1X Gage 4 4x4 pins

OPERATOR	ON DUTY	OFF DUTY
[illegible]	7 AM	2 PM

OD-31C REV. 4-59

7-8-64

FLORIDA POWER CORPORATION

TURNER PLANT
DAILY OPERATION REPORT

7-8-64

7-8-64

GENERATORS

TIME E.S.T.	BUS VOLTS 115	BUS VOLTS 69	No. 1 VOLTAGE D.C.	No. 1 VOLTAGE A.C.	No. 1 AMPERES D.C.	No. 1 AMPERES A.C.	No. 1 INDICATED MW	No. 1 INDICATED MVAR	No. 1 INTEGRATED METER	No. 1 INTEGRATED MWH
									33876	
1A	118	118								
2	119	118								
3	119	118								
4	118	118								
5	118	118								
6	118	118								
7	118	118								
8	119	118								
9	119	118								
10	119	118								
11	119	118								
12N	119	118								
1P	119	118								
2	119	118								
3	119	118								
4	119	118								
5	119	118								
6	119	118								
7	119	118								
8	119	118								
9	119	118								
10	119	118								
11	119	118								
12MN	119	118								

TIME E.S.T.	No. 2 VOLTAGE D.C.	No. 2 VOLTAGE A.C.	No. 2 AMPERES D.C.	No. 2 AMPERES A.C.	No. 2 INDICATED MW	No. 2 INDICATED MVAR	No. 2 INTEGRATED METER	No. 2 INTEGRATED MWH
							33876	
1A	130	117	275	625	15	+3	33885	15
2	130	117	275	625	15	+3	33900	15
3	130	117	275	625	15	+3	33915	15
4	120	117	250	625	15	0	33930	15
5	125	117	260	625	15	+1	33945	15
6	125	117	260	625	15	+2	33960	15
7	125	117	265	625	15	+2	33975	15
8	130	118	275	650	15	+3	33990	15
9	140	118	290	650	15	+5	34005	15
10	145	118	310	825	20	+5	34021	16
11	155	118	330	1050	25	+5	34043	22
12N	155	118	330	1050	25	+4	34065	22
1P	155	119	330	1050	25	+4	34087	22
2	155	118	330	1050	25	+4	34108	21
3	150	118	320	1015	25	+3	34129	21
4	150	118	330	1050	25	+4	34150	21
5	150	118	330	1050	25	+4	34171	21
6	150	118	300	950	25	+4	34192	21
7	145	118	290	650	15	+3	34213	21
8	150	118	300	650	15	+6	34238	25
9	160	118	330	1050	25	+5	34263	25
10	160	118	330	1050	25	+5	34288	25
11	150	117	310	1000	25	+4	34313	25
12MN	130	117	270	625	15	+2	34333	20

TIME E.S.T.	No. 3 VOLTAGE D.C.	No. 3 VOLTAGE A.C.	No. 3 AMPERES D.C.	No. 3 AMPERES A.C.	No. 3 INDICATED MW	No. 3 INDICATED MVAR	No. 3 INTEGRATED METER	No. 3 INTEGRATED MWH
							54976	
1A	100	113	500	1200	25	+10	54993	29
2	100	113	500	1100	25	+10	55012	29
3	90	112	460	1100	25	+5	55033	25
4	95	112	480	1100	25	+7	55053	25
5	95	112	480	1100	25	+7	55073	25
6	100	112	500	1500	35	+7	55098	26
7	100	112	500	1900	45	+8	55127	28
8	120	114	600	2300	50	+15	55173	46
9	150	115	710	2600	55	+29	55224	51
10	160	116	760	3100	65	+34	55272	56
11	180	116	820	3400	70	+41	55327	69
12N	200	117	880	3600	75	+48	55381	72
1P	190	116	850	3600	75	+43	55426	75
2	200	117	900	3700	75	+50	55486	75
3	205	117	900	3700	75	+50	55536	75
4	205	117	900	3700	75	+50	55586	75
5	205	117	900	3700	75	+50	55636	75
6	200	117	880	3600	75	+50	55686	75
7	190	117	840	3400	65	+50	55736	75
8	175	118	760	3200	55	+52	55791	55
9	170	118	750	3100	55	+53	55846	55
10	170	117	750	3100	55	+53	55901	55
11	170	116	740	3000	55	+47	55946	45
12MN	175	116	760	3100	55	+47	55988	42

TIME E.S.T.	No. 4 VOLTAGE D.C.	No. 4 VOLTAGE A.C.	No. 4 AMPERES D.C.	No. 4 AMPERES A.C.	No. 4 INDICATED MW	No. 4 INDICATED MVAR	No. 4 INTEGRATED METER	No. 4 INTEGRATED MWH
							57908	
1A	110	112	410	1160	25	+8	57934	26
2	100	112	400	1100	25	+5	57959	25
3	100	112	400	1100	25	+4	57984	25
4	95	111	370	1000	20	0	58005	21
5	95	111	360	900	20	0	58025	20
6	100	111	370	1100	25	0	58049	24
7	125	113	480	2000	45	+10	58084	35
8	140	113	520	2300	50	+15	58134	50
9	120	116	620	2200	55	+31	58185	51
10	185	116	620	3100	65	+35	58241	56
11	205	117	730	3500	70	+43	58310	69
12N	220	117	790	3700	75	+48	58382	72
1P	215	117	760	3600	75	+42	58456	74
2	220	117	780	3800	75	+50	58531	75
3	221	117	780	3800	75	+50	58606	75
4	220	117	790	3700	75	+50	58681	75
5	220	117	790	3700	75	+50	58756	75
6	215	117	780	3700	75	+50	58831	75
7	210	118	770	3600	75	+50	58906	75
8	210	118	750	3600	75	+50	58981	75
9	210	118	760	3600	75	+50	59056	75
10	215	117	770	3600	75	+50	59131	75
11	215	116	770	3600	75	+50	59206	75
12MN	210	116	760	3600	75	+50	59281	75

TIME E.S.T.	TOTAL MVAR	TOTAL GROSS OUTPUT MWH
1A	+21	68
2	+19	65
3	+12	65
4	+7	61
5	+8	60
6	+9	65
7	+15	88
8	+33	111
9	+65	117
10	+24	128
11	+89	160
12N	+100	169
1P	+94	124
2	+92	125
3	+103	125
4	+104	125
5	+105	125
6	+102	165
7	+105	135
8	+118	125
9	+110	115
10	+15	95
11	+35	95
12MN	+44	101

SILVER SPRINGS SW. 119 / WOODSMERE SW. 9930 / WOODSMERE SW. 9630

TIME E.S.T.	SILVER SPRINGS SW. 119 AMP.	MW	MVAR	WOODSMERE SW. 9930 AMP.	MW	MVAR	WOODSMERE SW. 9630 AMP.	MW	MVAR
1A	30	-4	-7	50	+11	+2	70	+14	+3
2	40	-7	-7	50	+10	+2	60	+12	+3
3	50	-5	-10	50	+10	0	60	+13	
4	50	-2	-9	50	+10	-1	60	+12	+1
5	50	-2	-10	50	+10	0	60	+12	
6	50	-5	-8	60	+12	-2	65	+13	
7	50	+2	-7	90	+20	0	120	+22	+3
8	55	+8	-2	115	+24	+2	145	+28	+3
9	90	+15	+2	135	+29	+12	120	+32	+3
10	80	+15	+3	155	+31	+14	170	+34	+3
11	80	+38	+4	160	+32	+18	200	+35	+3
12N	110	+33	+5	165	+33	+19	210	+32	+3
1P	120	+35	+3	120	+35	+18	220	+37	+3
2	210	+43	+11	120	+33	+20	220	+38	+3
3	125	+32	+10	120	+33	+19	220	+38	+3
4	180	+15	+12	180	+32	+20	220	+38	+3
5	100	+33	+10	180	+32	+20	210	+38	+3
6	110	+22	+8	160	+30	+20	210	+37	+3
7	70	+7	+12	160	+30	+20	200	+35	+3
8	80	+7	+16	150	+29	+22	170	+30	+3
9	80	-5	+17	140	+20	+22	120	+27	+3
10	110	+1	+3	140	+20	+19	160	+26	+1
11	20	-4	5	100	+20	+16	140	+23	+1
12MN	10	0	+1	80	+18	+8	120	+21	+1

INTEGRATING METERS

CIRCUIT	METER READINGS PRES	PREV	DIFF	CONST	MWH OUTPUT TODAY	MONTH	MW DEMANDS TODAY	MONTH	YEAR	1st OF MO. METER READ.
No. 1 GEN.	14862	14862	0	1000	0	0	0	0	0	14862
No. 1 STA. SERV.	5328	5326	2		2	14	.1	.1	.2	5314
No. 1 NET GEN.										
IN MVARH	386	386	0		0	0	0	0	0	386
OUT MVARH	1385	2385	0		0	0	0	0	0	2385
No. 2 GEN.	39748	39720	428		428	3516	45	30	32	30823
No. 2 STA. SERV.	240	0716	24		24	197	1.5	1.5	2.0	545
No. 2 NET GEN.			447		447	3319				
IN MVARH	6883	6883	0		0	0	0	0	3	6883
OUT MVARH	61508	61443	52		52	720	6	10	16	60528
No. 3 GEN.	55788	54776	1212		1212	9713	25	25	20	45815
No. 3 STA. SERV.	3215	3277	58		58	476	3.1	3.1	3.2	2839
No. 3 NET GEN.					1154	9217				
IN MVARH	32905	32905	0		0	0	0	0	12	32905
OUT MVARH	54110	53303	807		807	5256	60	66	26	27554
No. 4 GEN.	57080	57908	1172		1172	9639	15	75	20	45441
No. 4 SER. SERV.	4628	4576	52		52	463	4.0	3.6	2.3	4165
No. 4 NET GEN.					1120	9176				
IN MVARH	5943	5943	0		0	0	0	0	12	59493
OUT MVARH	1460	1401	693		693	4966	58	58	62	92669
ST. BY STA. SER.	516	2516	0	1000	0	0	0	0	14	2516
TOTAL PLANT GROSS GENERATION					2857	22860				
TOTAL PLANT STATION SERVICE					138	1170				
NET PLANT OUTPUT					2719	21692				
TOTAL IN MVARH					0	0				
TOTAL OUT MVARH					1501	11154				

#3 ST Ay 2938

CIRCUIT	METER READINGS PRES	PREV	DIFF	CONST	MWH OUTPUT TODAY	MONTH	MW DEMANDS TODAY	MONTH	YEAR	1st OF MO. METER READ.
SILVER SPGS. SW. 119	- MWH	45760	45760	29	1000	29	154	10	14	1.2	45729
	+ MWH	42226	42185	241		241	2115	40	40	42	156 25
WOODSMERE SW. 9930	- MWH	0	0	0		0	0	0	0	0	0
	+ MWH	44168	44113	55		55	4294	25	35	25	98128
WOODSMERE SW. 9630	- MWH	0	0	0		0	0	0	0	0	0
	+ MWH	50110	50044	66		66	5425	40	44	6.2	45565
115/69 KV BANK SW. 9833	MWH to 115	83240	83192	38		38	349	5	9	1.2	82526
	MWH to 69	38500	38486	14		14	172	3	6	2.1	38329
	MVARH to 115	52323	52323	0		0	0	0	0	0	52323
	MVARH to 69	93250	93046	114		172	1404	10	16	16	92846
SANFORD SW. 6630	- MWH	37385	37278	107		107	684	15	20	20	36698
	+ MWH	49122	49023	99		99	1156	15	29	4.1	28918
	- MVARH	21366	21354	12		12	188	4	9	5.0	21073
	+ MVARH	28320	28294	26		26	169	6	16	16	3916
N. LONGWOOD SW. 212	- MWH	0	0	0		0	0	0	0	0	0
	+ MWH	21360	21348	12		12	5792	4.2	4.5	6.2	21762
DE LAND SW. 1930	- MWH	2	2	0		0	0	0	0	0	2
	+ MWH	36746	36483	263		263	2853	23	22	2.1	33957
12 KV TOTAL	MWH	43202	42990	212		13	112	1.0	1.1	2.6	4363
SW. W-762	MWH	26260	26236	24	1000	24	194	6.5	6.7	3.5	9826

WEATHER CONDITIONS

TIME	TEMP.	CLEAR, CLOUDY, RAIN, LTNG.
8A	70	clear
4P	94	clear
12MN	77	clear

SWITCH OPERATION COUNTER

SWITCH	READING PRES	PREV	OPERATIONS TODAY	MONTH	YEAR
211		330	0	0	30
100		157	0	0	3
119		791	0	1	6
212		192	0	1	6
286		45	0	0	0
720		446	0	0	4
930		256	0	1	5
4030		312	0	0	6
6630		472	0	1	5
6640		401	0	1	5
7030		463	0	1	5
9630		450	0	1	7
9830		311	0	0	4
9833		204	0	1	5
9930		302	0	1	6
W-762		214	0	0	52
W-761		135	0	0	15

TRANSFORMER TEMPERATURE DEG. C.

TIME	No. 1			No. 2			BUS TIE			No. 3	No. 4
	1	2	3	1	2	3	1	2	3	3 PH	3 PH
4 A											
8 A											
12 N	13	40	18	—	59	61	40	41	29		
4 P											
8 P											
12 MN											

REMARKS: RECORD SWITCH OPERATIONS, RELAY TARGETS

BEST AVAILABLE COPY

7-8-64

TURNER PLANT
DAILY OPERATION REPORT

7-8-64

DAY & DATE WEDNESDAY JUL 8 1964

GENERATORS																		TOTAL MVAR	TOTAL GROSS OUTPUT MWH	TIME E.S.T.	115 KV CIRCUITS																		69 KV DELAND SW. 1930		
	No. 3							No. 4													SILVER SPRINGS SW. 119			WOODSMERE SW. 9930			WOODSMERE SW. 9630			115/69 KV BANK SW. 9833			SANFORD SW. 6630					N. LONGWOOD SW. 912					
RATED MWH	VOLTAGE D.C.	VOLTAGE A.C.	AMPERES D.C.	AMPERES A.C.	INDICATED MW	INDICATED MVAR	INTEGRATED METER	INTEGRATED MWH	VOLTAGE D.C.	VOLTAGE A.C.	AMPERES D.C.	AMPERES A.C.	INDICATED MW	INDICATED MVAR	INTEGRATED METER	INTEGRATED MWH				AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	IN METER	IN MWH	OUT METER	OUT MWH	AMP	MW	MVAR	AMP	MW	MVAR
							54776								53905																		72275		29777							
15	100	112	500	1200	25	+10	54402	27	110	112	410	1100	25	+8	52734	26	+21	68	1A	30	-4	-7	50	+18	+2	70	+14	+2	25	-5	+7	60	+12	0	72275	0	29776	3	95	+15	+2	105	+6	+10
	100	112	500	1100	25	+10			100	112	400	1100	25	+5			+18	65	2	40	-7	-7	70	+10	+2	50	+10	+2	20	-6	+6	70	+14	0	72271	0	29784	12	110	+11	+4	105	+9	+9
15	90	112	460	1100	25	+5	54453	25	100	112	400	1100	25	+4	53984	25	+12	65	3	50	-5	-10	50	+10	0	60	+12	0	25	-5	+7	70	+14	0	72271	0	29802	13	70	+15	+2	105	+9	+9
15	95	112	480	1100	25	+7	54478	25	95	111	470	1000	20	0	54005	21	+7	61	4	50	-2	-9	50	+10	-1	60	+12	+1	25	-5	+7	60	+12	0	72275	0	29815	13	65	+14	+2	100	+9	+9
15	95	112	480	1100	25	+7	54503	25	95	111	460	900	20	0	54025	20	+8	60	5	50	-2	-10	50	+10	0	60	+12	0	25	-5	+7	55	+9	0	72275	0	29825	10	65	+14	+2	100	+9	+8
15	100	112	500	1500	35	+7	54529	26	100	111	570	1100	25	0	54049	24	+9	65	6	50	-5	-8	60	+12	-2	65	+13	0	25	-5	+7	75	+15	+5	72275	0	29835	10	75	+17	0	100	+9	+8
15	100	112	520	1900	45	+8	54567	28	125	113	670	1800	45	+10	54084	35	+15	86	7	50	+2	-7	90	+20	0	120	+22	+2	25	-2	+8	80	+7	0	72295	0	29849	14	115	+25	+8	125	+12	+10
15	120	114	600	2300	50	+15	54613	46	140	113	820	2300	50	+15	54134	50	+33	111	8	55	+8	-2	115	+24	+2	145	+28	+8	30	+1	+6	10	-2	-3	72225	0	29859	10	140	+31	+9	150	+14	+12
15	150	115	210	2600	55	+29	54664	51	170	116	620	2300	55	+31	54185	51	+45	117	9	90	+15	+2	125	+29	+12	170	+32	+12	40	+3	+8	50	-12	0	72285	10	29859	0	120	+34	+13	140	+15	+12
16	160	116	260	3100	65	+34	54720	56	185	116	620	3100	65	+35	54241	56	+24	128	10	80	+15	+3	155	+31	+14	190	+34	+15	40	+1	+8	40	-10	-3	72299	14	29859	0	190	+38	+12	180	+13	+12
22	180	116	820	3400	70	+41	54787	69	205	112	230	3500	70	+43	54310	69	+89	160	11	190	+38	+4	160	+32	+18	200	+35	+18	30	0	+8	50	-12	0	72311	12	29859	0	195	+38	+20	195	+22	+10
25	200	112	580	3600	75	+48	54861	72	220	112	280	3700	75	+48	54382	72	+100	169	12N	160	+33	+5	165	+33	+19	210	+37	+19	30	0	+8	20	-6	+3	72318	7	29859	0	205	+40	+22	200	+23	+10
25	190	116	850	3600	75	+43	54926	75	215	111	260	3700	75	+42	54456	74	+94	174	1P	170	+35	+3	170	+35	+18	220	+37	+19	30	0	+8	40	-10	+3	72325	2	29859	0	215	+42	+22	200	+23	+10
25	200	111	550	3700	75	+43	55011	75	220	111	180	3800	75	+50	54531	75	+92	175	2	210	+43	+11	170	+33	+20	220	+38	+20	30	+1	+2	90	-18	0	72332	12	29859	0	215	+42	+23	205	+24	+8
25	205	111	880	3700	75	+50	55084	75	221	111	280	3800	75	+50	54606	75	+103	175	3	175	+32	+10	170	+33	+19	220	+38	+20	30	0	+8	20	-6	0	72346	9	29859	0	215	+42	+23	195	+23	+8
25	205	112	900	3700	75	+50	55161	75	220	112	290	3700	75	+50	54681	75	+104	175	4	180	+35	+12	180	+32	+20	220	+38	+21	20	+2	+5	40	-8	0	72356	10	29859	0	210	+40	+24	200	+23	+9
25	205	112	900	3700	75	+50	55236	75	220	112	290	3700	75	+50	54756	75	+105	175	5	100	+33	+10	180	+32	+20	220	+38	+22	10	0	+6	30	-6	0	72361	5	29859	0	220	+40	+25	200	+23	+8
25	205	111	900	3700	75	+50	55316	75	220	111	290	3700	75	+50	54836	70	+105	175	6	110	+22	+8	160	+30	+20	210	+37	+22	-0	+2	+5	20	-4	0	72370	9	29859	6	210	+39	+25	150	+16	+9
15	190	117	840	3100	55	+30	53366	60	205	112	710	2800	55	+26	52886	60	+105	135	7	70	+7	+12	160	+30	+20	200	+35	+21	20	+1	+6	40	-8	0	72375	5	29859	0	200	+36	+24	190	+14	+9
15	195	116	760	3100	55	+32	53441	58	210	116	750	3000	55	+32	52941	55	+110	125	8	50	+7	+16	150	+29	+22	170	+30	+22	10	0	+4	30	+6	0	72375	0	29865	6	190	+32	+25	140	+14	+9
25	190	118	750	3100	55	+55	53516	45	120	114	100	2100	55	+20	53006	45	+110	115	9	80	-5	+17	140	+20	+22	170	+27	+20	50	-8	+8	10	0	0	72375	0	29870	5	120	+30	+25	150	+15	+10
25	190	117	740	3100	45	+32	53566	40	165	117	540	2100	45	+15	53116	30	+110	95	10	10	+1	-3	130	+20	+19	160	+26	+14	20	-7	+8	20	-6	0	72390	5	29870	5	150	+30	+16	150	+16	+9
25	190	115	660	3100	45	+21	53646	40	135	116	340	2100	45	+16	53241	25	+110	95	11	20	-4	5	100	+20	+10	140	+23	+15	60	-10	+8	30	+4	0	72382	3	29870	0	130	+25	+16	135	+14	+8
30	125	114	610	1800	30	+2	53688	42	140	114	540	2000	40	+22	53230	39	+49	101	12MN	10	0	+1	150	+15	+8	120	+21	+7	25	-3	+7	60	+12	0	72382	0	29872	2	110	+25	+8	105	+10	+8

METER READINGS				MWH OUTPUT		MW DEMANDS			1st OF MO. METER READ.
PRES	PREV	DIFF	CONST	TODAY	MONTH	TODAY	MONTH	YEAR	
45760	45731	29	1000	29	1326	10	17	1-	45728
17226	17071	155		155	2115	46	46	46	15625
0	0	0		0	0	0	0	0	0
98800	98249	551		551	4390	55	55	55	98128
0	0	0		0	0	0	0	0	0
56110	55444	666		666	5426	46	46	64	45565
84240	83942	298		298	3449	5	9	14	83526
38500	38486	14		14	172	3	6	4-	38329
53923	53923	0		0	0	0	0	0	53923
73250	73078	172		172	1404	10	11	11	72846
37872	37771	101		101	694	15	20	20	36698
29772	29680	92		92	1156	15	28	28	28718
21360	21349	11		11	188	4	7	7-	21072
27320	27300	20		26	164	6	16	16	7216
0	0	0		0	0	0	0	0	0
32460	32448	12		12	5732	46	45	67	31963
2	0	2		2	0	0	0	0	2
24000	23838	162		162	2262	23	23	24	23957
4375	4362	13		13	113	160	161	24	4363
24000	23976	24	1000	24	194	4.5	4.7	5.5	4826

SWITCH OPERATION COUNTER					
SWITCH	READING PRES	READING PREV	OPERATIONS TODAY	OPERATIONS MONTH	OPERATIONS YEAR
211		320	0	0	30
100		157	0	0	3
119		721	0	1	6
212		190	0	1	6
286		45	0	0	0
720		146	0	0	4
1930		256	0	1	5
4030		312	0	0	6
6630		472	0	1	5
6640		401	0	1	5
7030		203	0	1	5
9630		457	0	1	7
9830		311	0	0	4
9833		204	0	1	5
9930		302	0	1	6
W-762		114	0	0	12
W-761		125	0	0	15

TRANSFORMER TEMPERATURE DEG. C.												
TIME	No. 1			No. 2			BUS TIE			No. 3	No. 4	
	1	2	3	1	2	3	1	2	3	3 PH	3 PH	
4 A												
8 A												
12 N	13	40	18	—	59	61	40	41	29			
4 P												
8 P												
12 MN												

IONS	
T, RAIN, LTNG.	

REMARKS: RECORD SWITCH OPERATIONS, RELAY TARGETS, UNUSUAL CONDITIONS, ETC.

OPERATOR	ON DUTY	OFF DUTY
	12	8
	8	4
	4	12

00-30C REV. 9-58

8/12/69

FLORIDA POWER CORPORATION

8/12/69

TURNER PLANT
DAILY OPERATION REPORT

8/12/69

GENERATORS

TIME E.S.T.	BUS VOLTS 115	BUS VOLTS 69	No. 1 VOLTAGE D.C.	No. 1 VOLTAGE A.C.	No. 1 AMPERES D.C.	No. 1 AMPERES A.C.	No. 1 INDICATED MW	No. 1 INDICATED MVAR	No. 1 INTEGRATED METER	No. 1 INTEGRATED MWH	No. 2 VOLTAGE D.C.	No. 2 VOLTAGE A.C.	No. 2 AMPERES D.C.	No. 2 AMPERES A.C.	No. 2 INDICATED MW	No. 2 INDICATED MVAR	No. 2 INTEGRATED METER	No. 2 INTEGRATED MWH	No. 3 VOLTAGE D.C.	No. 3 VOLTAGE A.C.	No. 3 AMPERES D.C.	No. 3 AMPERES A.C.	No. 3 INDICATED MW	No. 3 INDICATED MVAR	No. 3 INTEGRATED METER	No. 3 INTEGRATED MWH	No. 4 VOLTAGE D.C.	No. 4 VOLTAGE A.C.	No. 4 AMPERES D.C.	No. 4 AMPERES A.C.	No. 4 INDICATED MW	No. 4 INDICATED MVAR	No. 4 INTEGRATED METER	No. 4 INTEGRATED MWH	TOTAL MVAR	TOTAL GROSS OUTPUT MWH
1A	118	118							48306																											
2	118	118									140	118	290	650	15-	+5	48324	15	140	112	750	1100	25-	+8	95111	25	110	112	420	1100	25-	+10	95303	25	+23	65
3	118	118									146	118	290	650	15	+5	48336	15	95	112	470	1100	21	+7	95126	23	110	112	420	1200	25	+7	95328	23	+19	65
4	118	118									150	118	290	650	15	+5	48357	15	95	112	470	1000	20	+7	95158	22	105	112	400	1000	20	+7	95358	23	+19	60
5	118	118									140	118	290	650	15	+5	48366	15	95	112	470	1000	20	+7	95178	20	105	112	400	1000	20	+7	95478	22	+19	57
6	118	118									140	118	290	650	15	+5	48381	15	95	112	470	1000	20	+7	95238	20	100	112	380	1000	20	+7	95478	22	+19	57
7	118	118									140	118	290	650	15	+5	48396	15	100	112	470	1100	25-	+8	95229	25	100	112	380	1100	27	+7	95520	25	+21	57
8	118	118									150	118	300	675	15	+2	48411	15	100	112	500	1500	35	+10	95256	33	110	112	420	1600	37	+8	95559	35	+25	65
9	119	115									140	118	295	650	15	+6	48426	15	120	112	640	2500	55	+18	95303	42	140	112	520	2500	55	+18	95601	48	+25	81
10	119	118									145	119	345	1850	25	+2	48445	19	145	111	780	3000	60	+38	95340	51	180	111	740	3000	60	+38	95658	57	+40	110
11	119	118									120	119	345	1850	25	+2	48470	25	180	116	820	3350	70	+42	95429	69	200	111	720	3400	70	+42	95858	57	+81	133
12N	119	118									120	119	350	1850	25	+2	48492	25	200	111	870	3500	70	+42	95491	70	220	111	740	3500	70	+42	95722	69	+91	143
1P	119	118									150	120	355	1900	25	+2	48520	25	220	115	950	3800	80	+50	95566	80	220	111	740	3500	70	+42	95926	69	+102	164
2	119	118									105	121	360	1950	25	+5	48547	25	210	111	820	3650	80	+53	95639	80	220	111	720	3600	70	+52	95934	70	+113	165
3	119	118									120	119	350	1950	25	+8	48570	25	210	111	810	3700	80	+54	95809	80	220	111	720	3600	70	+52	96005	69	+118	164
4	119	118									110	119	345	1950	25	+7	48595	25	210	111	810	3700	80	+54	95999	80	220	111	720	3600	70	+52	96005	69	+118	164
5	119	118									160	119	330	1850	25	+5	48620	25	200	112	860	3500	70	+46	95849	70	210	112	700	3500	70	+46	95919	70	+104	145
6	119	118									120	119	300	700	12	+5	48645	25	190	116	740	3200	60	+48	95979	70	210	112	700	3600	70	+50	96145	70	+101	165
7	119	118									145	119	300	650	12	+5	48660	15	140	116	650	3300	65	+48	95964	65	200	112	720	3600	70	+52	96215	70	+99	165
8	119	118									145	119	300	650	12	+5	48682	15	185	116	840	3300	65	+48	96049	65	200	112	720	3600	65	+48	96220	65	+95	165
9	119	118									150	119	310	750	20	+6	48692	17	195	116	860	3300	70	+46	96117	68	210	112	716	3600	65	+48	96345	65	+95	165
10	119	118									145	119	300	850	15	+7	48716	20	190	116	840	3400	70	+42	96187	70	200	112	710	3500	70	+46	96413	68	+98	153
11	119	118									140	119	270	700	15	+4	48729	17	150	115	710	2800	55	+30	96252	62	200	112	710	3400	70	+40	96483	70	+86	160
12MN	118	118									140	118	290	700	15	+5	48744	15	130	114	640	1100	30	+26	96290	38	195	112	220	1100	30	+22	96506	38	+59	97
											130	119	300	700	15	+5	48757	15	120	117	600	1100	30	+25	96326	30	140	112	220	1100	30	+22	96616	30	+59	95

INTEGRATING METERS

CIRCUIT	METER READINGS PRES	PREV	DIFF	CONST	MWH OUTPUT TODAY	MONTH	MW DEMANDS TODAY	MONTH	YEAR	1st OF MO. METER READ.
No. 1 GEN.	14962	14862	0	1000	0	0	0	0	0	74962
No. 1 STA. SERV.	5378	5377	2		2	17	11	11	18	5362
No. 1 NET GEN.										
IN MVARH	386	386	0		0	0	0	0	0	386
OUT MVARH	7385	7385	0		0	0	0	0	0	7385
No. 2 GEN.	48755	48385	452		452	4748	22	26	32	44011
No. 2 STA. SERV.	1570	1546	24		24	279	13	23	23	1291
No. 2 NET GEN.					428	4469				
IN MVARH	6806	6806	0		0	0	0	0	2	6806
OUT MVARH	65905	65766	139		139	1536	10	11	16	64359
No. 3 GEN.	76120	75086	1234		1234	13405	70	75	80	72815
No. 3 STA. SERV.	5430	5890	60		60	702	3.0	3.5	3.5	4248
No. 3 NET GEN.					1174	12703				
IN MVARH	32915	32915	0		0	0	0	0	12	32915
OUT MVARH	59300	58568	732		732	8145	60	67	76	50555
No. 4 GEN.	94616	93378	1238		1238	14316	70	78	80	82300
No. 4 SER. SERV.	6660	6627	56		56	701	3.0	3.2	3.2	5973
No. 4 NET GEN.					1182	13609				
IN MVARH	59509	59509	0		0	0	0	0	15	59509
OUT MVARH	21975	21263	712		712	9027	60	63	63	12948
STBY STA. SER.	1153	2753	0	1000	0	14	0	14	14	2238
TOTAL PLANT GROSS GENERATION					2921	32769				2516
TOTAL PLANT STATION SERVICE					142	1719				
NET PLANT OUTPUT					2782	30750				
TOTAL IN MVARH					0	0				
TOTAL OUT MVARH					1583	19308				

CIRCUIT		METER READINGS PRES	PREV	DIFF	CONST	MWH OUTPUT TODAY	MONTH	MW DEMANDS TODAY	MONTH	YEAR	1st OF MO. METER READ.
SILVER SPGS. SW. 119	- MWH	46632	46612	23	1000	22	240	4	24	24	46295
	+ MWH	28660	27647	413		413	3139	52	52	55	24721
WOODSMERE SW. 9930	- MWH	0	0	0		0	2	0	0	0	0
	+ MWH	23395	22659	636		636	1278	40	40	50	18012
WOODSMERE SW. 9630	- MWH	0	0	0		0	0	0	0	0	0
	+ MWH	76050	75310	240		240	9011	45	45	62	67079
115/69 KV BANK SW. 9833	MWH to 115	25010	24980	30		30	252	4	6	12	24658
	MWH to 69	32640	39613	27		27	446	4	8	22	29194
	MVARH to 115	53925	53923	0		0	0	0	0	2	53923
	MVARH to 69	4620	4565	115		115	1957	8	9	16	2923
SANFORD SW. 6630	- MWH	45019	44657	356		356	9504	40	40	66	41569
	+ MWH	32156	32146	6		6	459	5	22	22	31693
	- MVARH	22540	22469	0		0	360	10	14	26	22269
	+ MVARH	52000	45177	103		103	551	16	21	21	4729
N. LONGWOOD SW. 212	= MWH	0	0	0		0	0	0	0	0	0
DELAND SW. 1930	+ MWH	43710	43580	140		140	9636	48	49	64	54224
	- MWH	2	02	0		0	0	0	0	0	2
12 KV TOTAL	MWH	5000	4795	15		15	185	10	12	20	4815
SW. W-762	MWH	5941	5917	30	1000	30	340	20	20	35	5607

WEATHER CONDITIONS

TIME	TEMP.	CLEAR, CLOUDY, RAIN, LTNG.
8A	77	Clear
4P	76	Clear
12MN	78	Clear

SWITCH OPERATION COUNTER

SWITCH	READING PRES	READING PREV	OPERATIONS TODAY	OPERATIONS MONTH	OPERATIONS YEAR
211		320	0	6	30
100		159	0	2	2
119		791	0	0	6
212		190	0	0	6
286		45	0	0	0
720		447	0	0	5
1930		287	0	1	6
4030		313	0	0	6
6630		472	0	0	5
6640		401	0	0	5
7030		263	0	0	5
9630		450	0	0	7
9830		312	0	0	5
9633		294	0	0	6
9930		302	0	0	6
W-762		122	0	1	41
1111		132	0	0	2

TRANSFORMER TEMPERATURE DEG. C.

TIME	No. 1			No. 2			BUS TIE			No. 3 3PH	No. 4 3PH
	1	2	3	1	2	3	1	2	3		
4 A											
8 A											
12 N	50	46	46	-	65	65	45	42	80		
4 P											
8 P											
12 MN											

REMARKS: RECORD SWITCH OPERATIONS, RELAY TARGETS, U

TIME E.S.T.	SILVER SPRINGS SW. 119 AMP.	MW	MVAR	WOODSMERE SW. 9930 AMP.	MW	MVAR	WOODSMERE SW. 9630 AMP.	MW	MVAR
1A	10	-2	-3	60	+12	0	100	+19	+3
2	20	0	-8	60	+12	0	80	+18	+2
3	30	-5	-8	50	+11	-1	80	+16	+2
4	30	-4	-7	50	+11	-3	75	+15	+1
5	20	-5	-7	50	+11	-2	75	+16	+2
6	30	+3	-10	60	+12	-2	80	+16	+2
7	25	-4	-3	80	+18	-1	120	+22	+4
8	80	+13	-6	140	+30	+2	155	+30	+5
9	80	+18	+2	165	+36	+12	180	+32	+10
10	200	+47	+3	185	+38	+18	200	+32	+14
11	230	+49	+8	185	+38	+20	200	+36	+18
12N	235	+49	+9	195	+39	+22	210	+38	+11
1P	160	+33	+6	185	+37	+21	230	+41	+23
2	185	+38	+2	120	+39	+20	240	+42	+22
3	185	+37	+8	185	+38	+19	240	+42	+21
4	180	+35	+10	170	+36	+18	238	+42	+24
5	90	+8	+16	165	+34	+17	220	+40	+20
6	80	+12	+10	170	+35	+16	230	+42	+20
7	75	+14	+6	160	+33	+14	220	+40	+18
8	100	+17	+8	170	+36	+14	230	+42	+18
9	75	+14	+6	160	+33	+10	220	+40	+15
10	40	+8	+5	130	+24	+10	180	+31	+12
11	20	-3	+7	100	+18	+8	140	+24	+10
12MN	20	-1	+3	80	+18	+6	130	+24	+10

BEST AVAILABLE COPY

8/12/64

TURNER PLANT
DAILY OPERATION REPORT

8/12/64

DAY & DATE WEDNESDAY AUG 12 1964

GENERATORS

	No. 3 INDICATED MW	No. 3 INDICATED MVAR	No. 3 INTEGRATED METER	No. 3 INTEGRATED MWH	No. 3 VOLTAGE D.C.	No. 3 VOLTAGE A.C.	No. 3 AMPERES D.C.	No. 3 AMPERES A.C.	No. 4 INDICATED MW	No. 4 INDICATED MVAR	No. 4 INTEGRATED METER	No. 4 INTEGRATED MWH	No. 4 VOLTAGE D.C.	No. 4 VOLTAGE A.C.	No. 4 AMPERES D.C.	No. 4 AMPERES A.C.	TOTAL MVAR	TOTAL GROSS OUTPUT MWH
1			48306								95086							
2	+5	+8	48321	15	180	112	460	1100	25	+8	95111	25	110	112	420	1100	+23	65
3	+5	+7	48336	15	95	112	470	1100	25	+7	95136	25	110	112	420	1100	+19	61
4	+5	+7	48357	15	95	112	470	1000	30	+7	95158	22	105	112	420	1000	+19	60
5	+5	+7	48366	15	95	112	470	1000	20	+7	95178	20	105	112	400	1000	+19	57
6	+5	+7	48381	15	95	112	470	1000	20	+7	95198	20	100	112	380	1000	+15	57
7	+5	+7	48396	15	100	112	460	1000	25	+8	95223	25	100	112	380	1000	+18	65
8	+2	+7	48411	15	100	112	500	1500	35	+10	95256	33	110	112	420	1500	+25	81
9	+6	+6	48426	15	130	112	640	2500	55	+18	95303	47	140	112	520	2500	+46	140
10	+2	+6	48445	19	165	111	250	3000	40	+38	95360	57	180	111	460	2900	+56	158
11	+2	+6	48470	25	180	111	820	3350	20	+42	95427	67	200	111	720	3400	+81	183
12	+2	+6	48496	25	200	111	820	3500	20	+49	95497	70	220	111	720	3600	+90	202
13	+2	+6	48520	25	210	111	820	3650	20	+53	95637	70	220	111	720	3800	+99	220
14	+2	+6	48545	25	210	111	810	3700	20	+54	95707	70	220	111	720	3900	+103	228
15	+2	+6	48570	25	210	111	810	3700	20	+54	95778	71	220	111	720	3900	+103	228
16	+2	+6	48595	25	210	111	810	3700	20	+54	95848	70	220	111	720	3900	+103	228
17	+2	+6	48615	20	210	111	810	3700	20	+54	95902	54	220	111	720	3900	+103	228
18	+5	+6	48620	25	200	112	860	3500	20	+46	95949	70	220	112	760	3600	+90	202
19	+5	+6	48645	25	190	116	840	3200	60	+48	95919	70	210	112	760	3600	+90	202
20	+5	+6	48660	15	190	116	820	3300	65	+45	95964	65	200	112	760	3600	+95	195
21	+5	+6	48675	15	185	110	820	3300	65	+46	96049	65	200	112	760	3600	+95	195
22	+6	+6	48692	17	195	110	860	3500	70	+46	96117	68	210	112	760	3600	+98	195
23	+4	+6	48716	20	190	116	840	3400	70	+42	96187	70	200	112	760	3600	+96	195
24	+4	+6	48729	17	150	113	660	2600	55	+30	96252	65	170	110	640	2600	+69	141
25	+5	+6	48744	17	130	114	640	1200	30	+26	96290	38	145	115	320	1100	+29	91
26	+5	+6	48759	15	125	114	640	1200	30	+25	96320	30	140	115	320	1100	+28	91

	TOTAL MVAR	TOTAL GROSS OUTPUT MWH
1		
2	+23	65
3	+19	60
4	+19	57
5	+15	57
6	+18	65
7	+25	81
8	+40	110
9	+48	133
10	+43	123
11	+48	127
12 N	+49	135
1 P	+43	145
2	+38	164
3	+37	185
4	+35	165
5	+34	165
6	+33	195
7	+34	145
8	+34	153
9	+36	160
10	+40	197
11	+28	91
12MN	+18	75

TIME E.S.T.	SILVER SPRINGS SW. 119 AMP.	MW	MVAR	WOODSMERE SW. 9930 AMP.	MW	MVAR	WOODSMERE SW. 9630 AMP.	MW	MVAR	115/69 KV BANK SW. 9833 AMP.	MW	MVAR
1A	10	-2	-3	40	+12	0	100	+19	+3	20	-4	+4
2	20	0	-8	60	+12	0	90	+18	+2	20	-4	+5
3	30	-5	-8	50	+11	-2	80	+16	+2	20	-4	+5
4	30	-4	-7	50	+11	-3	75	+15	+2	20	+3	+5
5	20	-5	-7	50	+11	-2	75	+16	+2	20	-4	+5
6	30	+3	-10	60	+12	-2	80	+18	+3	20	-3	+5
7	25	-3	-3	80	+18	-1	120	+22	+4	20	-2	+5
8	80	+13	-6	140	+30	+7	155	+30	+5	30	+2	+6
9	80	+18	+2	165	+36	+12	180	+37	+10	30	0	+6
10	200	+42	+3	185	+38	+18	200	+37	+14	30	+2	+7
11	230	+48	+8	185	+38	+20	200	+36	+18	30	+3	+9
12N	235	+49	+9	185	+39	+22	210	+38	+19	30	+3	+9
1P	160	+33	+6	185	+37	+21	230	+41	+23	10	0	+3
2	185	+38	+7	170	+39	+20	240	+42	+22	10	0	+4
3	185	+37	+8	185	+38	+18	240	+42	+21	10	+1	+4
4	180	+35	+10	170	+36	+18	230	+40	+21	10	+1	+4
5	90	+8	+16	165	+34	+17	220	+40	+20	10	+2	+4
6	80	+12	+10	170	+35	+16	230	+42	+20	20	+4	+6
7	75	+14	+6	160	+33	+14	220	+40	+18	15	+2	+6
8	100	+17	+8	170	+36	+14	230	+42	+18	10	+1	+6
9	75	+14	+6	160	+33	+10	220	+40	+15	20	0	+7
10	40	+8	+5	130	+24	+10	180	+31	+12	10	-0	+6
11	20	-3	+7	100	+18	+8	140	+24	+10	20	+4	+6
12MN	10	-1	+3	80	+18	+6	130	+24	+10	25	-4	+7

	115 KV CIRCUITS SANFORD SW. 6630 AMP.	MW	MVAR	IN METER	IN MWH	OUT METER	OUT MWH	N. LONGWOOD SW. 212 AMP.	MW	MVAR	69 KV DELAND SW. 1930 AMP.	MW	MVAR
1				44617		32196							
2	10	+1	0	44660	3	32197	1	95	+20	+5	100	+10	+5
3	10	-2	0	44661	1	32197	0	90	+19	+5	100	+10	+5
4	10	-2	0	44662	1	32197	0	85	+18	+4	95	+10	+5
5	10	-2	0	44665	3	32197	0	85	+17	+3	95	+10	+5
6	10	0	+1	44667	2	32197	0	85	+18	+3	95	+10	+5
7	15	-3	+5	44668	1	32197	0	85	+18	+3	110	+10	+10
8	10	+2	0	44669	1	32197	0	95	+21	+5	125	+11	+11
9	30	-8	+3	44673	5	32197	0	145	+33	+7	150	+15	+10
10	100	-14	+13	44688	15	32197	0	185	+37	+13	185	+20	+11
11	130	-26	+5	44714	26	32197	0	185	+39	+18	220	+25	+10
12N	180	-36	+14	44751	37	32197	0	200	+39	+20	220	+26	+10
1P	190	-32	+15	44782	36	32197	0	205	+40	+22	220	+26	+9
2	130	-26	+9	44820	33	32197	0	230	+43	+26	185	+23	+8
3	140	-32	+8	44853	33	32197	0	245	+42	+26	195	+23	+8
4	120	-33	+5	44888	35	32197	0	240	+42	+29	200	+24	+9
5	130	-26	0	44920	32	32197	0	230	+43	+23	190	+23	+8
6	90	-18	0	44945	25	32197	0	230	+43	+22	150	+15	+9
7	80	-16	0	44962	17	32197	1	230	+44	+22	150	+16	+9
8	60	-10	0	44977	15	32197	0	220	+43	+20	150	+15	+11
9	50	-10	0	44990	13	32197	0	220	+45	+21	170	+15	+10
10	10	0	0	44994	4	32197	0	215	+43	+18	160	+17	+8
11	20	-4	0	44996	2	32197	0	175	+35	+15	130	+14	+8
12MN	60	-12	0	45000	4	32197	0	175	+35	+15	120	+11	+9
	10	0	0	45013	13	32197	0	120	+25	+11	110	+10	+8

METERS

CIRCUIT		METER READINGS PRES	PREV	DIFF	CONST	MWH OUTPUT TODAY	MONTH	MW DEMANDS TODAY	MONTH	YEAR	1st OF MO. METER READ
SPGS.	- MWH	46635	46612	23	1000	23	340	4	2	4	46295
119	+ MWH	28060	27647	413		413	3139	52	52	52	24721
WOODSMERE	- MWH	0	0	0		0	0	0	0	0	0
9930	+ MWH	23295	22659	636		636	7278	40	40	50	16012
WOODSMERE	- MWH	0	0	0		0	0	0	0	0	0
9630	+ MWH	76050	75310	740		740	9011	42	45	61	67079
115 KV BANK	MWH to 115	30010	84980	30		30	522	4	6	12	84658
9833	MWH to 69	39640	39613	27		27	946	4	4	22	39194
	MVARH to 115	53923	53923	0		0	0	0	0	3	53923
	MVARH to 69	4620	4565	55		115	1257	8	9	10	2923
3RD	- MWH	45011	44657	354		356	3504	40	40	60	41509
6630	+ MWH	32136	32146	6		6	489	5	26	32	31693
	- MVARH	22540	22509	6		0	360	10	14	26	22209
	+ MVARH	5260	5177	103		103	551	10	21	20	4729
LONGWOOD	- MWH	0	0	0		0	0	0	0	0	0
212	+ MWH	64310	63580	730		730	9636	48	49	64	54734
212	- MWH	2	02	0		0	0	0	0	0	2
1930	+ MWH	49235	48854	381		381	4111	26	26	46	45124
TOTAL	MWH	5000	4795	15		15	185	10	13	26	4815
7762	MWH	5241	5211	30	1000	30	340	20	20	35	5607

WEATHER CONDITIONS

TEMP.	CLEAR, CLOUDY, RAIN, LTNG.
77	Clear
76	Clear
78	Clear

SWITCH OPERATION COUNTER

SWITCH	READING PRES	READING PREV	OPERATIONS TODAY	OPERATIONS MONTH	OPERATIONS YEAR
211		320	0	0	30
100		159	0	2	5
119		791	0	0	6
212		190	0	0	6
286		45	0	0	0
720		447	0	0	5
1930		287	0	1	6
4030		313	0	0	6
6630		472	0	0	5
6640		401	0	0	5
7030		263	0	0	5
9630		450	0	0	7
9830		312	0	0	5
9833		294	0	0	5
9930		302	0	0	6
W-762		222	0	1	4
7762		135	0	0	2

TRANSFORMER TEMPERATURE DEG. C.

TIME	No. 1			No. 2			BUS TIE			No. 3	No. 4
	1	2	3	1	2	3	1	2	3	3 PH	3 PH
4 A											
8 A											
12 N	30	16	46	-	62	65	45	42	80		
4 P											
8 P											
12 MN											

REMARKS: RECORD SWITCH OPERATIONS, RELAY TARGETS, UNUSUAL CONDITIONS, ETC.

OPERATOR	ON DUTY	OFF DUTY
	12	8
	8	4
	4	12

OD-30C REV. 8-58

8/17/69

FLORIDA POWER CORPORATION

8/17/69

TURNER PLANT
DAILY OPERATION REPORT

8/17/69

GENERATORS

TIME E.S.T.	BUS VOLTS 115	BUS VOLTS 69	No. 1 VOLTAGE D.C.	No. 1 VOLTAGE A.C.	No. 1 AMPERES D.C.	No. 1 AMPERES A.C.	No. 1 INDICATED MW	No. 1 INDICATED MVAR	No. 1 INTEGRATED METER	No. 1 INTEGRATED MWH	No. 2 VOLTAGE D.C.	No. 2 VOLTAGE A.C.	No. 2 AMPERES D.C.	No. 2 AMPERES A.C.	No. 2 INDICATED MW	No. 2 INDICATED MVAR	No. 2 INTEGRATED METER	No. 2 INTEGRATED MWH	No. 3 VOLTAGE D.C.	No. 3 VOLTAGE A.C.	No. 3 AMPERES D.C.	No. 3 AMPERES A.C.	No. 3 INDICATED MW	No. 3 INDICATED MVAR	No. 3 INTEGRATED METER	No. 3 INTEGRATED MWH	No. 4 VOLTAGE D.C.	No. 4 VOLTAGE A.C.	No. 4 AMPERES D.C.	No. 4 AMPERES A.C.	No. 4 INDICATED MW	No. 4 INDICATED MVAR	No. 4 INTEGRATED METER	No. 4 INTEGRATED MWH	TOTAL MVAR	TOTAL GROSS OUTPUT MWH
									50322																01381								01665			
1A	118	112									120	112	255	425	15	+1	50332	15	118	112	530	1200	25	+15	01406	25	120	112	440	1200	25	+15	01690	25	+31	45
2	118	112									120	112	260	425	15	+1	50352	15	105	113	530	1200	25	+15	01432	26	110	113	430	1200	25	+11	01715	25	+27	66
3	118	112									120	112	260	425	15	+1	50362	15	100	112	490	1100	25	+8	01452	25	110	112	430	1200	25	+11	01740	25	+20	45
4	118	112									120	112	260	425	15	+1	50382	15	100	112	490	1100	25	+8	01482	25	110	113	430	1200	25	+10	01766	26	+19	66
5	118	112									120	112	260	425	15	+1	50392	15	100	112	500	1100	25	+10	01509	25	110	113	430	1200	25	+10	01791	25	+21	65
6	118	112									120	112	260	425	15	+1	50412	15	100	112	500	1100	25	+11	01522	25	110	113	430	1200	25	+12	01816	25	+24	65
7	118	118									145	118	300	450	15	+6	50427	15	115	114	520	1400	25	+23	01557	25	125	114	420	1200	25	+18	01841	25	+41	65
8	119	118									160	119	340	250	15	+10	50442	15	150	114	700	2400	45	+30	01537	35	165	115	600	2500	45	+32	01876	35	+72	85
9	119	118									185	119	375	300	20	+11	50458	16	180	116	880	3000	55	+46	01645	53	210	117	750	2500	70	+47	01936	60	+101	129
10	119	119									185	119	360	1150	25	+9	50485	27	220	118	960	3600	70	+60	01712	67	225	117	800	3200	70	+55	02008	72	+124	166
11	118	118									190	119	375	1275	30	+8	50515	30	220	117	960	3600	70	+60	01728	70	235	117	820	3200	75	+56	02082	74	+123	174
12N	118	118									185	119	360	1250	30	+7	50545	30	225	117	960	3600	75	+58	01853	71	230	117	810	3200	75	+55	02158	76	+120	177
1P	118	118									185	119	365	1250	30	+7	50575	30	225	117	960	3700	65	+63	01922	69	235	117	810	3200	75	+55	02234	76	+125	175
2	118	118									170	119	350	1025	25	+7	50604	29	220	117	940	3700	65	+60	01987	65	235	117	810	3200	70	+58	02306	72	+125	166
3	118	118									170	119	345	1050	25	+6	50629	25	220	117	940	3500	60	+63	02047	60	235	118	810	3200	70	+58	02376	70	+127	155
4	119	118									170	119	340	1050	25	+6	50654	25	210	118	940	3500	60	+60	02110	63	225	118	790	3200	70	+52	02446	70	+118	158
5	119	118									150	119	300	850	15	+5	50679	25	215	118	930	3400	60	+60	02180	70	220	118	750	3400	60	+50	02516	70	+115	165
6	119	118									145	119	300	850	15	+5	50694	12	210	118	920	3500	60	+58	02240	60	210	118	740	3400	60	+50	02576	60	+113	135
7	119	118									145	119	300	850	15	+5	50709	15	200	117	880	3400	60	+59	02300	60	210	118	740	3400	60	+50	02636	60	+109	135
8	119	118									140	118	290	850	15	+5	50724	15	205	117	880	3400	60	+55	02360	60	210	117	750	3400	60	+50	02696	60	+110	135
9	119	118									140	118	290	850	15	+5	50739	12	195	117	860	3300	60	+50	02420	60	210	117	745	3300	60	+50	02756	60	+105	135
10	119	118									125	118	260	650	15	+4	50754	15	115	116	720	3000	60	+40	02480	60	145	116	690	3000	60	+41	02816	60	+22	135
11	119	118									115	112	240	650	15	+4	50769	12	150	116	660	2500	50	+20	02598	60	160	116	660	2500	60	+20	02916	60	-64	135
12MN	118	117									130	117	220	625	15	+3	50784	15	130	114	620	1900	40	+22	02580	40	140	114	520	1700	40	+22	02916	40	+48	95

TIME E.S.T.	SILVER SPRINGS SW. 119 AMP.	SILVER SPRINGS SW. 119 MW	SILVER SPRINGS SW. 119 MVAR	WOODSMERE SW. 9930 AMP.	WOODSMERE SW. 9930 MW	WOODSMERE SW. 9930 MVAR	WOODSMERE SW. 9630 AMP.	WOODSMERE SW. 9630 MW	WOODSMERE SW. 9630 MVAR
1A	30	-8	0	50	+13	+2	105	+20	+2
2	50	-10	0	50	+13	0	100	+19	+2
3	20	+2	-6	40	+12	0	90	+18	+2
4	30	-6	-3	40	+12	0	90	+18	+3
5	30	-6	-3	50	+13	0	90	+18	+3
6	20	-3	-3	50	+13	+1	90	+18	+2
7	10	0	+2	60	+13	+8	120	+21	+2
8	20	+4	+4	120	+24	+10	180	+30	+1
9	130	+26	+4	160	+32	+16	220	+38	+2
10	210	+45	+7	170	+30	+24	225	+35	+2
11	175	+35	+12	190	+32	+29	250	+38	+3
12N	215	+43	+18	180	+32	+25	240	+39	+2
1P	165	+32	+13	180	+32	+25	250	+40	+2
2	165	+33	+13	185	+31	+28	240	+39	+2
3	165	+34	+13	180	+30	+22	230	+36	+2
4	170	+35	+10	180	+30	+22	230	+37	+2
5	70	+5	+14	170	+34	+20	230	+40	+2
6	80	+14	+10	170	+33	+21	230	+41	+2
7	60	+7	+12	180	+34	+20	230	+40	+2
8	80	+12	+10	160	+32	+20	230	+40	+2
9	20	+10	+10	160	+31	+18	220	+38	+2
10	20	+3	+6	140	+22	+12	146	+34	+1
11	15	+2	+2	120	+14	+7	120	+20	+1
12MN	10	0	-2	90	+20	+2	140	+24	+2

INTEGRATING METERS

CIRCUIT	METER READINGS PRES	PREV	DIFF	CONST	MWH OUTPUT TODAY	MONTH	MW DEMANDS TODAY	MONTH	YEAR	1st OF MO. METER READ.
No.1 GEN.	14862	14862	0	1000	0	0	0	0		14862
No.1 STA.SERV.	5315	5315	0		0		0	11	18	5962
No.1 NET GEN.										
IN MVARH	386	386	0		0	0	0	0	0	386
OUT MVARH	7385	7385	0		0	0	0	0		17885
No.2 GEN.	50784	50322	462		462	17722	30	35		44041
No.2 STA.SERV.	1690	1660	30		30	2227	11	23		1221
No.2 NET GEN.					432	15495				
IN MVARH	6806	6806	0		0	0	0	3		6806
OUT MVARH	66560	66430	130		130	6221	11	16		64369
No.3 GEN.	02580	01381	1199		1199	19615	60	60		829115
No.3 STA.SERV.	5765	5700	65		65	1961	3.9	3.9		4748
No.3 NET GEN.					1134	18654				
IN MVARH	32915	32915	0		0	0	0	12		32915
OUT MVARH	63210	62370	960		960	12705	11	20		502555
No.4 GEN.	02476	01665	1251		1251	19665	60	60		822200
No.4 SER.SERV.	6920	6920	66		66	1035	3.3	3.3		5973
No.4 NET GEN.					1171	18630				
IN MVARH	59509	59509	0		0	0	0	12		59509
OUT MVARH	25750	24850	900		960	12705	62	63		329480
ST BY STA SER.	2253	2253	0	1000	0	14	14	14		5773
TOTAL PLANT GROSS GENERATION					2912	42054				
TOTAL PLANT STATION SERVICE					155	2466				
NET PLANT OUTPUT					2757	44588				
TOTAL IN MVARH					0	0				
TOTAL OUT MVARH					1990	24655				

CIRCUIT		METER READINGS PRES	PREV	DIFF	CONST	MWH OUTPUT TODAY	MONTH	MW DEMANDS TODAY	MONTH	YEAR	1st OF MO. METER READ.
SILVER SPGS. SW. 119	- MWH	46740	46700	40	1000	40	445	20	22	29	46295
	+ MWH	29500	29200	300		300	4654	54	52	52	24927
WOODSMERE SW. 9930	- MWH	0	0	0		0	0	0	0		0
	+ MWH	26300	25700	600		600	10282	34	48	50	16017
WOODSMERE SW. 9630	- MWH	0	0	0		0	0	0	0	0	0
	+ MWH	77940	79070	770		770	12201	42	45	63	67033
115/69 KV BANK SW. 9833	MWH to 115	85150	85120	30		30	492	5	6	12	24658
	MWH to 69	39820	39200	20		20	626	5	10	23	39194
	MVARH to 115	5522	5519	0		0	0	0	0	3	53923
	MVARH to 69	5440	5280	160		160	2517	10	30	10	2923
SANFORD SW. 6630	- MWH	46020	45760	260		260	4529	22	40	70	41509
	+ MWH	32535	32520	15		15	866	10	22	39	31693
	- MVARH	24650	24600	50		50	491	12	14	20	22209
	+ MVARH	5500	5480	20		20	771	8	20	20	4729
N. LONGWOOD SW. 212	- MWH	0	0	0		0	0	0	0	0	0
	+ MWH	62410	61600	810		810	13670	45	49	68	54731
DELAND SW. 1930	- MWH	2	2	0		0	0	0	0	0	02
	+ MWH	51000	50610	390		390	2776	21	21	27	45124
12 KV TOTAL	MWH	5015	5060	15		15	260	11	12	20	6915
SW. W-762	MWH	6100	6068	32	1000	32	493	210	40	3.5	5607

WEATHER CONDITIONS

TIME	TEMP.	CLEAR, CLOUDY, RAIN, LTNG.
8A	77	clear
4P	94	cloudy
12MN	77	clear

SWITCH OPERATION COUNTER

SWITCH	READING PRES	READING PREV	OPERATIONS TODAY	OPERATIONS MONTH	OPERATIONS YEAR
211		320	0	0	30
100		159	0	2	5
119		791	0	0	6
212		190	0	0	6
286		45	0	0	0
720		441	0	0	5
1930		247	0	1	6
4030		313	0	0	6
6630		496	0	0	5
6640		401	0	0	2
7030		263	0	0	5
9630		450	0	0	7
9830		312	0	0	5
9833		294	0	0	5
9930		302	0	0	6
W-762		223	0	2	41
[illegible]		645	0	0	22

REMARKS: RECORD SWITCH OPERATIONS, RELAY TARGETS, ETC.

TRANSFORMER TEMPERATURE DEG. C.

TIME	No. 1			No. 2			BUS TIE			No. 3 3 PH	No. 4 3 PH
	1	2	3	1	2	3	1	2	3		
4A											
8A											
12 N											
4P	33	66	45	-	70	72	46	51	82		
8P											
12 MN											

BEST AVAILABLE COPY

8/17/64

TURNER PLANT
DAILY OPERATION REPORT

8/17/64

DAY B DATE AUG 17 1964

GENERATORS

No. 3									No. 4									TOTAL MVAR	TOTAL GROSS KILOWATT MWH	TIME EST
INDICATED MVAR	INTEGRATED METER	INTEGRATED MWH	VOLTAGE D.C.	VOLTAGE A.C.	AMPERES D.C.	AMPERES A.C.	INDICATED MW	INDICATED MVAR	INTEGRATED METER	INTEGRATED MWH	VOLTAGE D.C.	VOLTAGE A.C.	AMPERES D.C.	AMPERES A.C.	INDICATED MW	INDICATED MVAR	INTEGRATED METER	INTEGRATED MWH			
	50322								01381								01665				
+1	50332	15	118	112	530	1200	25	+15	01406	25	120	112	440	1200	25	+15	01690	25	122	45	1A
+1	50352	15	105	113	570	1200	25	+15	01432	26	110	112	430	1200	25	+11	01715	25	122	46	2
+1	50362	15	100	112	490	1100	25	+8	01457	25	110	112	430	1200	25	+11	01740	25	120	45	3
+1	50382	15	100	112	490	1100	25	+8	01482	25	110	112	420	1200	25	+11	01766	26	119	44	4
+1	50392	15	100	112	500	1100	25	+10	01507	25	110	112	425	1200	25	+10	01791	25	122	45	5
+1	50412	15	100	112	500	1100	25	+11	01532	25	110	112	420	1200	25	+12	01816	25	122	45	6
+10	50442	15	150	114	700	2400	45	+30	01597	32	160	115	600	2500	45	+32	01874	35	+72	55	8
+11	50458	16	180	116	800	3000	55	+46	01645	59	210	117	730	3500	70	+47	01933	60	+109	129	9
+9	50485	27	220	118	960	3800	70	+60	01712	67	225	117	860	3800	70	+55	02008	75	+124	166	10
+6	50513	30	220	117	960	3800	70	+60	01782	70	235	117	890	3800	70	+55	02078	74	+123	174	11
+7	50645	30	225	117	960	3800	75	+58	01853	71	235	117	910	3800	75	+53	02158	76	+126	177	12N
+7	50575	30	225	117	960	3700	65	+63	01924	60	235	117	910	3800	75	+55	02234	76	+125	175	1P
+7	50604	29	220	117	940	3700	65	+60	01987	65	233	117	890	3700	70	+50	02306	72	+125	166	2
+6	50620	25	220	117	940	3500	60	+63	02047	60	235	118	910	3700	70	+58	02376	70	+127	155	3
+6	50634	25	210	118	940	3500	60	+60	02110	62	220	116	790	3300	60	+52	02446	70	+116	150	4
+5	50628	25	215	118	930	3400	60	+60	02180	70	220	118	750	3400	60	+50	02516	70	+115	145	5
+5	50629	12	210	118	920	3300	60	+58	02240	60	210	116	740	3400	60	+50	02576	60	+113	125	6
+5	50209	15	200	117	880	3400	60	+54	02300	60	210	117	740	3400	60	+50	02626	60	+102	125	7
+5	50124	15	205	117	880	3400	60	+55	02360	60	210	117	750	3400	60	+50	02676	60	+110	135	8
+5	50139	12	195	117	860	3300	60	+50	02420	60	210	117	745	3500	60	+50	02726	60	+105	135	9
+4	50124	12	115	116	520	2000	50	+40	02470	60	170	117	730	3000	60	+41	02776	60	+102	125	10
+4	50142	12	120	116	600	2200	50	+30	02518	60	180	117	740	3100	60	+42	02826	60	+102	125	11
+7	50149	15	170	114	720	2800	40	+22	02560	40	140	114	610	2400	40	+32	02874	40	+90	100	12MN

115 KV CIRCUITS

SILVER SPRINGS SW 119			WOODSMERE SW 9930			WOODSMERE SW 9630			115/69 KV BANK SW 9833			SANFORD SW 6630						N. LONGVIEW SW 919			69 KV DELAND SW 1930		
AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	AMP	MW	MVAR	IN METER	IN MWH	OUT METER	OUT MWH	AMP	MW	MVAR	MW	MVAR
															45760		32535						
20	-5	0	50	+13	+2	105	+20	+2	90	-5	+8	10	0	-2	45763	3	32533	0	105	+21	+8	+8	+8
20	-5	0	50	+13	0	100	+19	+5	90	-5	+8	10	+2	-1	45765	0	32535	0	95	+19	+8	+8	+8
20	-5	-6	40	+12	0	90	+18	+3	90	-3	+8	20	-6	0	45766	3	32536	1	85	+17	+8	+8	+2
20	-4	-3	40	+12	0	80	+18	+4	50	-5	+8	10	+4	-2	45768	2	32539	3	95	+20	+8	+8	+8
20	-4	-3	50	+13	0	80	+18	+4	50	-5	+8	10	+4	-2	45768	0	32540	1	95	+20	+8	+8	+8
20	-4	-3	50	+13	+1	90	+19	+5	40	-4	+8	10	0	-2	45768	0	32540	0	95	+20	+8	+8	+8
20	0	+2	60	+12	+8	120	+22	+10	30	-3	+6	80	-2	-2	45773	5	32545	5	115	+23	+8	+8	+4
20	+1	+5	60	-13	0	145	+26	+14	20	+1	+5	60	-13	0	45781	14	32559	0	170	+34	+8	+8	+14
20	+3	+5	150	-30	+7	145	+28	+15	20	+3	+5	150	-30	+7	45795	12	32571	0	220	+43	+8	+8	+14
15	+1	+3	90	-20	0	145	+23	+14	15	+1	+3	90	-20	0	45823	24	32546	0	225	+38	+8	+8	+10
10	-1	+2	90	-18	-12	145	+28	+14	10	-1	+2	90	-18	-12	45844	21	32591	0	240	+42	+8	+8	+8
10	-1	+2	80	-14	-15	145	+28	+14	10	-1	+2	80	-14	-15	45862	18	32614	0	240	+42	+8	+8	+6
15	-2	+4	90	-16	-13	145	+28	+14	15	-2	+4	90	-16	-13	45878	16	32594	0	250	+44	+8	+8	+8
15	+1	+4	120	-22	-6	145	+28	+14	15	+1	+4	120	-22	-6	45897	19	32546	0	230	+43	+8	+8	+8
15	+1	+4	140	-28	0	145	+25	+14	15	+1	+4	140	-28	0	45922	25	32546	0	225	+43	+8	+8	+9
20	+3	+6	100	-20	0	145	+22	+14	20	+3	+6	100	-20	0	45942	20	32546	0	220	+42	+8	+8	+10
30	+2	+6	80	-16	0	145	+22	+14	30	+2	+6	80	-16	0	45958	16	32546	0	220	+42	+8	+8	+10
30	+2	+7	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	45976	18	32546	0	240	+44	+8	+8	+10
30	+2	+7	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	45988	12	32546	0	225	+43	+8	+8	+9
40	0	+6	120	-22	0	145	+23	+14	40	0	+6	90	-18	0	46006	18	32546	0	230	+43	+8	+8	+10
40	-2	+8	70	-14	0	145	+23	+14	40	-2	+8	70	-14	0	46020	14	32546	0	220	+42	+8	+8	+10
40	-2	+8	80	-16	0	145	+23	+14	30	-2	+7	80	-16	0	46036	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	46054	18	32546	0	240	+44	+8	+8	+10
40	-2	+8	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	46066	12	32546	0	225	+43	+8	+8	+9
40	-2	+8	70	-14	0	145	+23	+14	30	+2	+7	70	-14	0	46080	14	32546	0	220	+42	+8	+8	+10
40	-2	+8	80	-16	0	145	+23	+14	30	+2	+7	80	-16	0	46096	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	46114	18	32546	0	240	+44	+8	+8	+10
40	-2	+8	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	46126	12	32546	0	225	+43	+8	+8	+9
40	-2	+8	70	-14	0	145	+23	+14	30	+2	+7	70	-14	0	46140	14	32546	0	220	+42	+8	+8	+10
40	-2	+8	80	-16	0	145	+23	+14	30	+2	+7	80	-16	0	46156	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	46174	18	32546	0	240	+44	+8	+8	+10
40	-2	+8	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	46186	12	32546	0	225	+43	+8	+8	+9
40	-2	+8	70	-14	0	145	+23	+14	30	+2	+7	70	-14	0	46200	14	32546	0	220	+42	+8	+8	+10
40	-2	+8	80	-16	0	145	+23	+14	30	+2	+7	80	-16	0	46216	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	46234	18	32546	0	240	+44	+8	+8	+10
40	-2	+8	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	46246	12	32546	0	225	+43	+8	+8	+9
40	-2	+8	70	-14	0	145	+23	+14	30	+2	+7	70	-14	0	46260	14	32546	0	220	+42	+8	+8	+10
40	-2	+8	80	-16	0	145	+23	+14	30	+2	+7	80	-16	0	46276	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	46294	18	32546	0	240	+44	+8	+8	+10
40	-2	+8	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	46306	12	32546	0	225	+43	+8	+8	+9
40	-2	+8	70	-14	0	145	+23	+14	30	+2	+7	70	-14	0	46320	14	32546	0	220	+42	+8	+8	+10
40	-2	+8	80	-16	0	145	+23	+14	30	+2	+7	80	-16	0	46336	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	46354	18	32546	0	240	+44	+8	+8	+10
40	-2	+8	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	46366	12	32546	0	225	+43	+8	+8	+9
40	-2	+8	70	-14	0	145	+23	+14	30	+2	+7	70	-14	0	46380	14	32546	0	220	+42	+8	+8	+10
40	-2	+8	80	-16	0	145	+23	+14	30	+2	+7	80	-16	0	46396	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	46414	18	32546	0	240	+44	+8	+8	+10
40	-2	+8	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	46426	12	32546	0	225	+43	+8	+8	+9
40	-2	+8	70	-14	0	145	+23	+14	30	+2	+7	70	-14	0	46440	14	32546	0	220	+42	+8	+8	+10
40	-2	+8	80	-16	0	145	+23	+14	30	+2	+7	80	-16	0	46456	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	46474	18	32546	0	240	+44	+8	+8	+10
40	-2	+8	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	46486	12	32546	0	225	+43	+8	+8	+9
40	-2	+8	70	-14	0	145	+23	+14	30	+2	+7	70	-14	0	46500	14	32546	0	220	+42	+8	+8	+10
40	-2	+8	80	-16	0	145	+23	+14	30	+2	+7	80	-16	0	46516	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	46534	18	32546	0	240	+44	+8	+8	+10
40	-2	+8	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	46546	12	32546	0	225	+43	+8	+8	+9
40	-2	+8	70	-14	0	145	+23	+14	30	+2	+7	70	-14	0	46560	14	32546	0	220	+42	+8	+8	+10
40	-2	+8	80	-16	0	145	+23	+14	30	+2	+7	80	-16	0	46576	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	46594	18	32546	0	240	+44	+8	+8	+10
40	-2	+8	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	46606	12	32546	0	225	+43	+8	+8	+9
40	-2	+8	70	-14	0	145	+23	+14	30	+2	+7	70	-14	0	46620	14	32546	0	220	+42	+8	+8	+10
40	-2	+8	80	-16	0	145	+23	+14	30	+2	+7	80	-16	0	46636	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	46654	18	32546	0	240	+44	+8	+8	+10
40	-2	+8	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	46666	12	32546	0	225	+43	+8	+8	+9
40	-2	+8	70	-14	0	145	+23	+14	30	+2	+7	70	-14	0	46680	14	32546	0	220	+42	+8	+8	+10
40	-2	+8	80	-16	0	145	+23	+14	30	+2	+7	80	-16	0	46696	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	46714	18	32546	0	240	+44	+8	+8	+10
40	-2	+8	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	46726	12	32546	0	225	+43	+8	+8	+9
40	-2	+8	70	-14	0	145	+23	+14	30	+2	+7	70	-14	0	46740	14	32546	0	220	+42	+8	+8	+10
40	-2	+8	80	-16	0	145	+23	+14	30	+2	+7	80	-16	0	46756	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	46774	18	32546	0	240	+44	+8	+8	+10
40	-2	+8	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	46786	12	32546	0	225	+43	+8	+8	+9
40	-2	+8	70	-14	0	145	+23	+14	30	+2	+7	70	-14	0	46800	14	32546	0	220	+42	+8	+8	+10
40	-2	+8	80	-16	0	145	+23	+14	30	+2	+7	80	-16	0	46816	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	46834	18	32546	0	240	+44	+8	+8	+10
40	-2	+8	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	46846	12	32546	0	225	+43	+8	+8	+9
40	-2	+8	70	-14	0	145	+23	+14	30	+2	+7	70	-14	0	46860	14	32546	0	220	+42	+8	+8	+10
40	-2	+8	80	-16	0	145	+23	+14	30	+2	+7	80	-16	0	46876	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	46894	18	32546	0	240	+44	+8	+8	+10
40	-2	+8	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	46906	12	32546	0	225	+43	+8	+8	+9
40	-2	+8	70	-14	0	145	+23	+14	30	+2	+7	70	-14	0	46920	14	32546	0	220	+42	+8	+8	+10
40	-2	+8	80	-16	0	145	+23	+14	30	+2	+7	80	-16	0	46936	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	46954	18	32546	0	240	+44	+8	+8	+10
40	-2	+8	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	46966	12	32546	0	225	+43	+8	+8	+9
40	-2	+8	70	-14	0	145	+23	+14	30	+2	+7	70	-14	0	46980	14	32546	0	220	+42	+8	+8	+10
40	-2	+8	80	-16	0	145	+23	+14	30	+2	+7	80	-16	0	46996	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	47014	18	32546	0	240	+44	+8	+8	+10
40	-2	+8	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	47026	12	32546	0	225	+43	+8	+8	+9
40	-2	+8	70	-14	0	145	+23	+14	30	+2	+7	70	-14	0	47040	14	32546	0	220	+42	+8	+8	+10
40	-2	+8	80	-16	0	145	+23	+14	30	+2	+7	80	-16	0	47056	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14	30	+2	+7	90	-18	0	47074	18	32546	0	240	+44	+8	+8	+10
40	-2	+8	60	-12	0	145	+23	+14	30	+2	+7	60	-12	0	47086	12	32546	0	225	+43	+8	+8	+9
40	-2	+8	70	-14	0	145	+23	+14	30	+2	+7	70	-14	0	47100	14	32546	0	220	+42	+8	+8	+10
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40	-2	+8	80	-16	0	145	+23	+14	30	+2	+7	80	-16	0	47656	16	32546	0	230	+43	+8	+8	+10
40	-2	+8	90	-18	0	145	+23	+14

FILED COPY
JUL 12 1966

Exhibit No. (E-2) 40

ESTIMATED INITIAL COSTS OF MAKING MINUTE PROPERTY EVALUATIONS AND SETTING UP NEW ACCOUNTING TECHNIQUES UNDER FEDERAL POWER COMMISSION JURISDICTION

COMPANY A - as of January 1964

Plant Account - $683,000,000
Employees - 4,750
Inventory of $160,000,000 Plant Account in 1937 at that time cost better than $2,500,000 using up to 400 people and requiring about three years. In addition to this cost, the salaries and expenses of 100 public utility engineers had to be paid for one year for the purpose of certifying inventories.

COMPANY B - as of January 1964

Plant Account - $250,000,000
Employees - 1,700
Inventory of $60,000,000 Plant Account in 1942 cost better than $750,000 and required up to 100 people more than two years to complete.

COMPANY C - as of January 1964

Plant Account - $411,000,000
Employees - 2,300
Estimated cost of inventory made about 1939 of the then $40,000,000 of Plant Account is $500,000. About 50 people and three years were required.

FLORIDA POWER & LIGHT COMPANY -

Based on studies and estimates of Treasury staff and Chief Engineer of Company, it is concluded that a project similar to those listed for Companies A, B and C might cost from $4,000,000 to $6,000,000 and require 200-300 people from two to three years. This is based on a Plant Account in service of about $840,000,000 as of June 1965, and 4,900 employees as of that date.

FEDERAL POWER COMMISSION
Docket No. E-7210
Hearing Ex. 40
Date Identified OCT 4 1965
Date Admitted OCT 5 1965

CERTIFIED COPY
OCT 12 1966

41

Exhibit No. (E-3)

ESTIMATED ANNUAL COST OF MAINTAINING
ACCOUNTING RECORDS UNDER FPC REGULATION

	Number Employees	Total Payroll
General Office		
Engineers	2	$ 24,000
Accountants	2	20,000
Clerks	6	50,000
Clerks	12	84,000
Clerks	20	114,000
Clerks	5	26,000
	47	318,000
Field		
Engineers/Accountants	5	60,000
Clerks	5	25,000
Sub-total	57	403,000
Other Cost Items		
Fringe Benefits - 20% of Payroll		80,600
Overtime - 5% of Payroll		20,150
Meals and Expenses		8,000
Supplies, Office equip., space, etc.		5,000
		113,750
Total Annual Cost		$516,750

Note: The foregoing does not include designing, setting up, or conversion costs to any system which may be required.

FEDERAL POWER COMMISSION
Docket No. E-7210
Exhibit No. 41
Date Identified OCT 4 1965
Date Admitted OCT 5 1965

Hearing Exhibit No. 41 (1230)

EXHIBIT NO. 42 (B-1)
DOCKET NO. E-7210

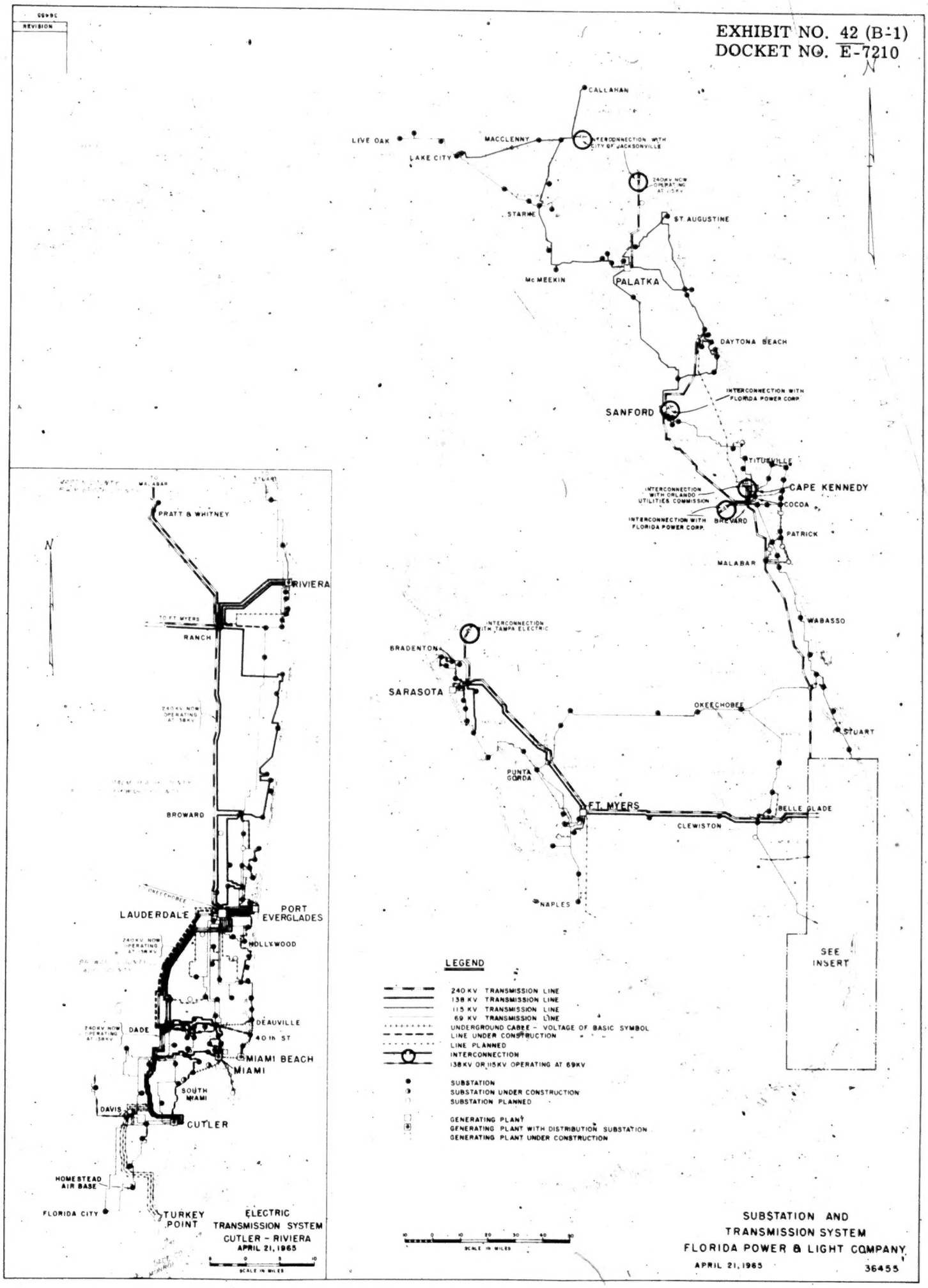
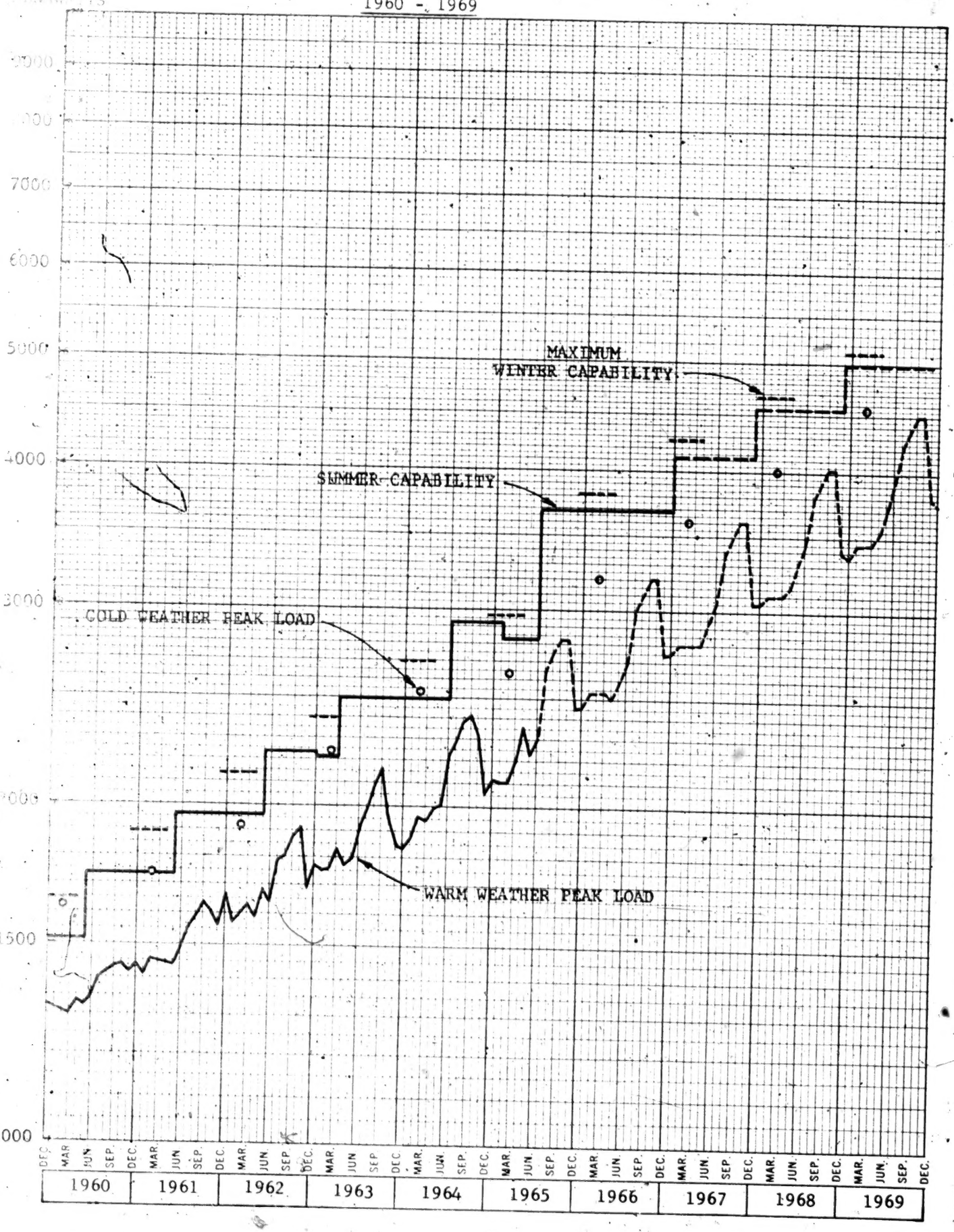


EXHIBIT NO. 43 (B-2)
DOCKET NO. E-7210

R.1232

FLORIDA POWER & LIGHT COMPANY
COMPARISON OF GENERATING CAPABILITY AND PEAK LOADS
1960 - 1969



Hearing Exhibit No. 43 (1232)

Hearing Exhibit No. 45

EXHIBIT 45 (B-4)
DOCKET NO. E-7210

SINGLE CONDUCTOR DIAGRAM
230 KV

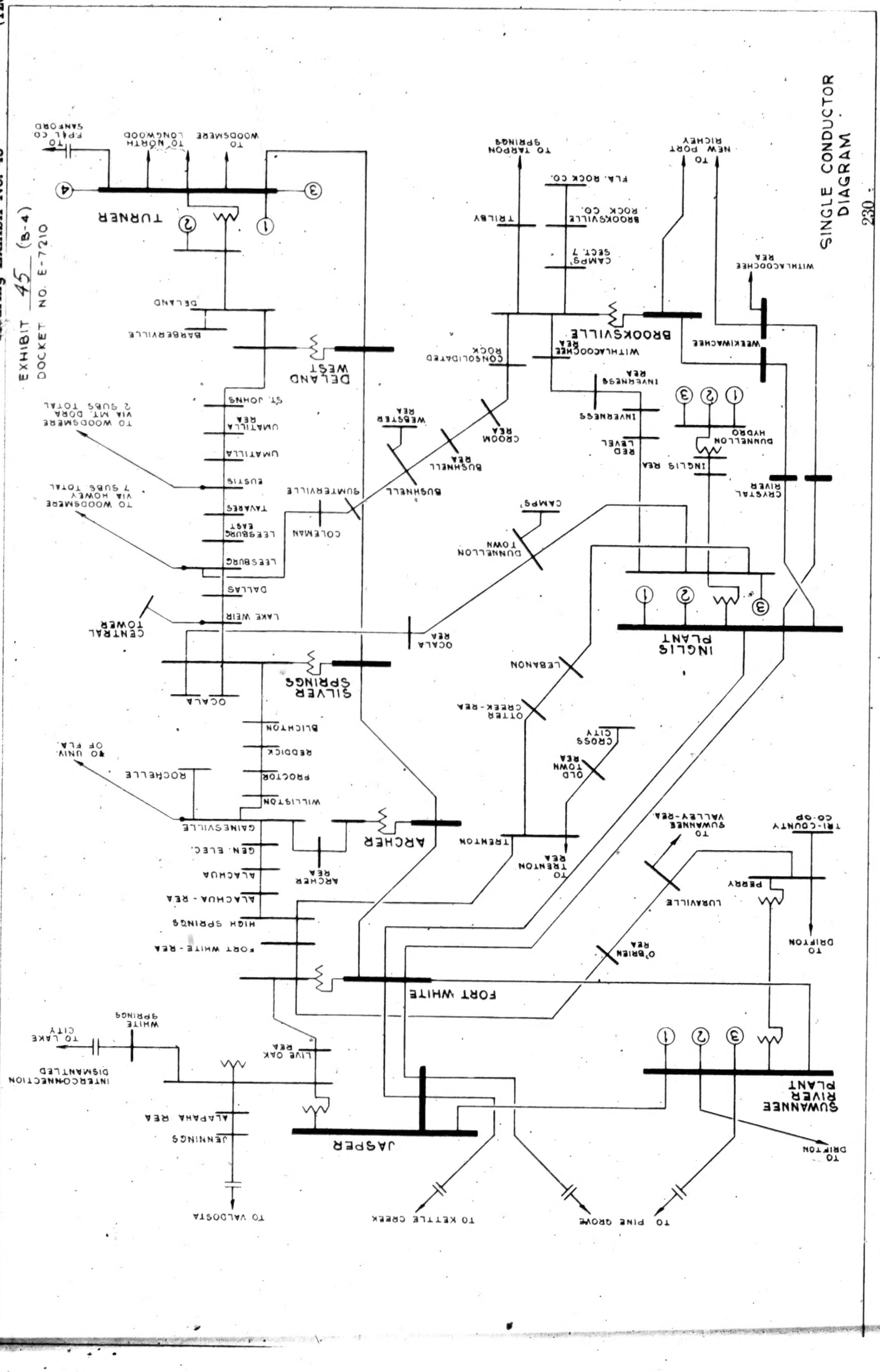
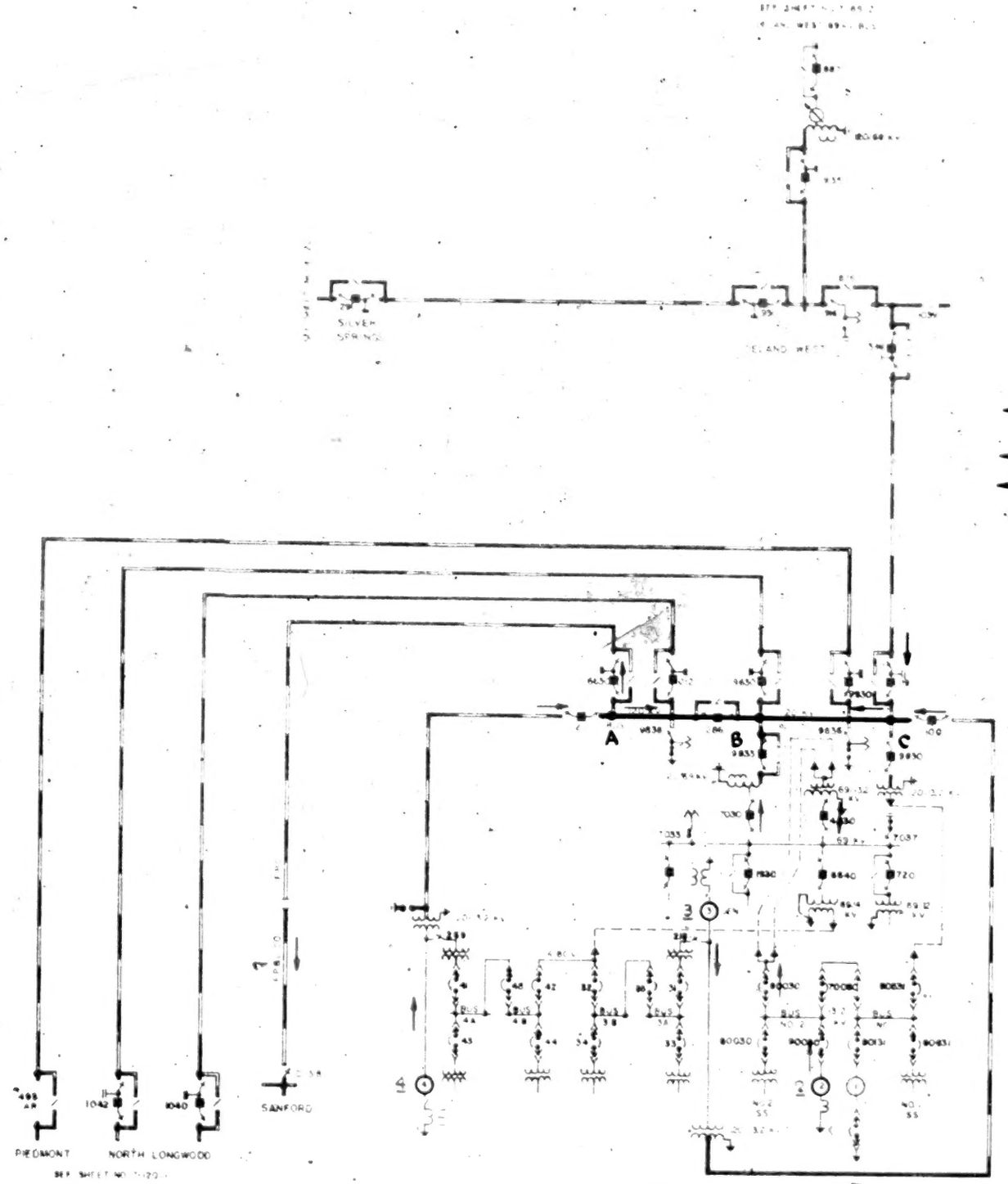


EXHIBIT NO. 47 (B-)
DOCKET NO. E-7210

N



← UNIDENTIFIED POWER FROM DELAND WEST
← TURNER GENERATION
← TURNER GENERATION AND POWER FROM DELAND WEST

FLOW DIAGRAM TURNER PLANT

Re: Staff Exhibit No. 18

REVISIONS				
REV. NO.	BY	CHECKED	APPROVED	TO DATE
2	J.D			12-31-64
1	J.D			6-30-64

FLORIDA POWER CORPORATION

SYSTEM ONE-LINE SWITCHING DIAGRAM

DRAWN BY DATE 12-30-64
CHECKED BY DATE 12-30-64
APPROVED BY DATE 12-30-64

DWG. NO. 6840-D-7-120-2

(1239)

Hearing Exhibit No. 49

Exhibit No. 49 (B-8)

Westinghouse Electric Corporation

Building 8L37
East Pittsburgh, Pa 15112
Telephone [illegible]

August 10, 1965

Mr. Harry V. Street
Chief Engineer
Florida Power and Light Company
P.O. Box 3100
Miami, Florida 33101

Dear Mr. Street:

Mr. P. T. Garrett has asked us to supply you with a list of electric utility companies for whom we have done load flow studies. This list is attached. The list of utilities for whom we have done digital load flow studies is based on our billing records. The list of utilities using the a-c network calculator is, however, based on memory. If you desire a more accurate list of a-c network calculator users, we can supply such a list but will require more time.

Very truly yours,

C. J. Baldwin

C. J. Baldwin
Manager, Advanced Development
Electric Utility Engineering

by A. D. Patton
Advanced Development Engineer

ADP:imp
Encl.

cc: Mr. P. T. Garrett
Mr. G. F. Gilfiland

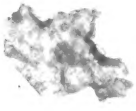
DIGITAL LOAD FLOW CUSTOMERS 1957-1965

AEP-OE-APS Joint
Alabama Power
Allegheny Power System
American Electric Power
Boston Edison
Carolina Power and Light
Central Power and Light
Cleveland Electric Illuminating
Cleveland-Ohio Edison-Toledo Edison-AEP Joint
Columbus and Southern Ohio Electric
Commonwealth Edison
Consumers Power-Detroit Edison Joint
Consumers Power
Convex
Duke Power
Duquesne Light
Duquesne Light-APS Joint
Ebasco Services
The Five Northwest Utilities
Florida Power and Light (secondary network)
Florida Power Corporation (secondary network)
General Public Utilities
Georgia Power
Hawaiian Electric Company
Houston Lighting and Power (secondary network)
Illinois Power
Indiana Power and Light
Iowa Electric Light and Power
Iowa Public Service
Memphis Power and Light
Metropolitan Edison
Middle South Services
Montana Power
Ohio Edison
Ohio Edison-Cleveland Elect. Ill. Joint
Ohio Valley Electric Corp.
Pennsylvania Power
Pennsylvania Power and Light
Potomac Edison
Public Service Electric and Gas
Public Service of Colorado
Public Service of Indiana
Public Service of New Hampshire
Public Service of Oklahoma
Quebec Hydro
Rochester Gas & Electric
South Carolina Gas and Electric
Southern Illinois Co-operative
Southern Nevada
Southern Services

Texas Power and Light
Toledo Edison
Tucson Gas and Electric
Utah Power & Light
Utah Power & Light - Idaho Power Joint
VEPCO
Western Intertie
Western Mass. Electric (secondary network)
West Penn Power

A-C NETWORK CALCULATOR CUSTOMERS

American Electric Power
Manitoba Hydro
Nova Scotia-New Brunswick
Ohio Valley Electric Corp.
Ontario Hydro
Southern Services



(1242)

Hearing Exhibit No. 50

Exhibit No. 50 (8-9

GENERAL ELECTRIC COMPANY

ELECTRIC UTILITY SALES DIVISION

[redacted] TELEPHONE 877-8311

P. O. Box 10577, Tampa, Fla. 33609

August 16, 1965

Mr. H. V. Street
Chief Engineer
Florida Power & Light Company
Miami, Florida

Dear Mr. Street:

Reference: AC Load Flow Studies

You inquired as to the availability of a list of the electric utilities using our AC network analyzer and digital computer facilities. This listing has never been compiled in a single tabulation. In general, we have not kept a running list of users in this area.

I can say that up through 1960, we had run more than 900 system studies on our AC network analyzer in Schenectady, most of which involved load flow on an electric utility system. These users represent just about every utility company in the country.

In the digital computer area, we run studies for approximately 60 different customers each year. Somewhere between 15 and 25 of these customers are new customers in each year in the use of our digital facilities. These digital studies almost invariably cover AC load flow calculations plus additional calculations possibly on stability, short circuit, etc.

Yours very truly,

J. C. Hartley

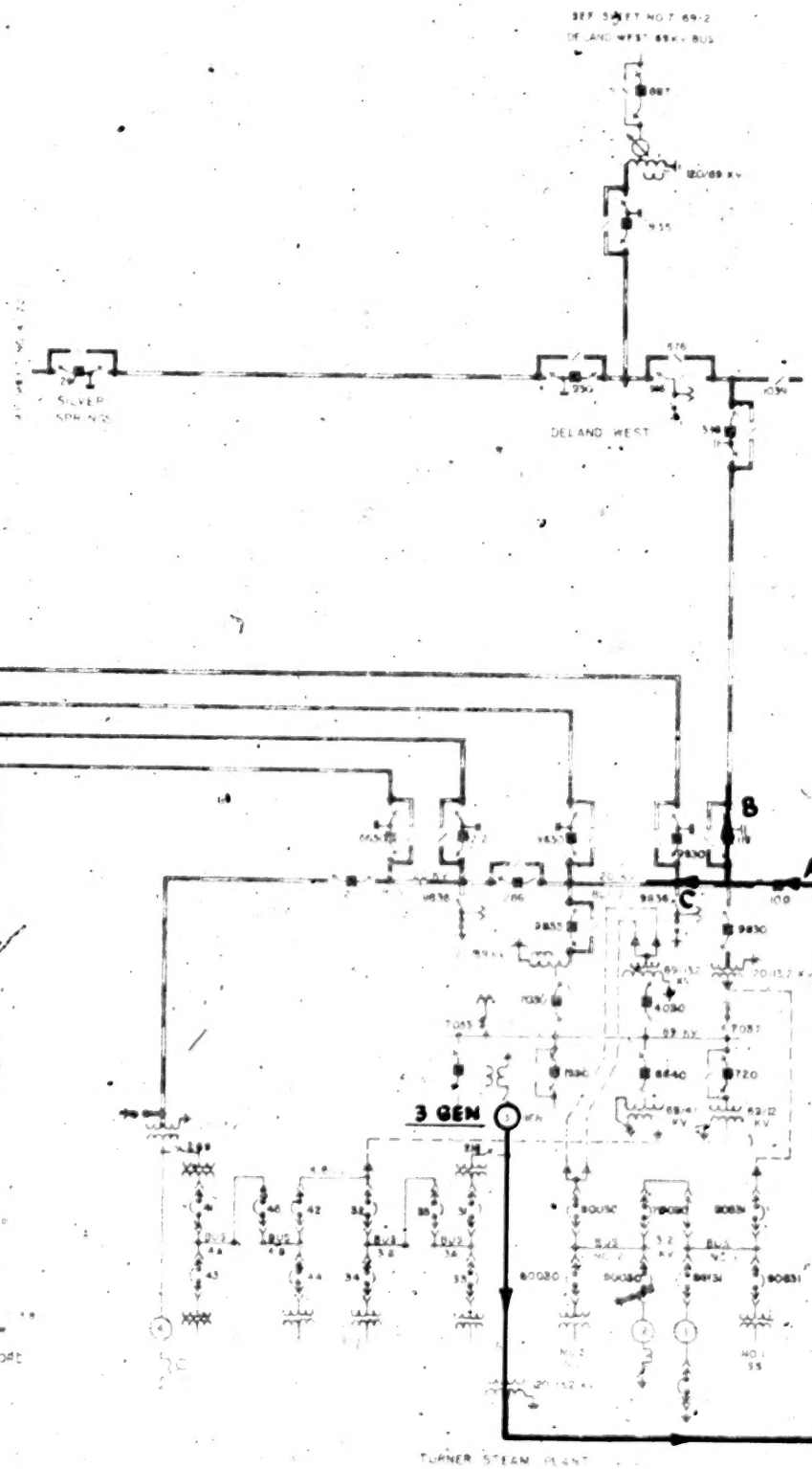
J. C. Hartley
Manager - Application Engineering

ibb

EXHIBIT NO. 51 (B-10)
DOCKET NO. E-7210

Sheet 1

N



DIRECTION OF POWER FLOW

FLOW DIAGRAM TURNER PLANT

REVISIONS				
REV. NO.	BY	CHECKED	APPROVED	TO DATE
2	J.D.			12-31-64
1	J.D.			6-30-64

FLORIDA POWER CORPORATION

SYSTEM ONE-LINE SWITCHING DIAGRAM

DRAWN BY J.D. DATE 12-30-63
CHECKED BY DATE 12-30-64
APPROVED BY DATE 12-30-64

DWG. NO. 6840-D-7-120-2

EXHIBIT NO. 51 (B-10)
DOCKET NO. E-7210

Sheet 2

N

DIRECTION OF POWER FLOW

FLOW DIAGRAM
FT. WHITE SUBSTATION

REVISIONS				
REV. NO.	BY	CHECKED	APPROVED	TO DATE
2	J.D.			12-31-84
1	J.D.			6-30-84

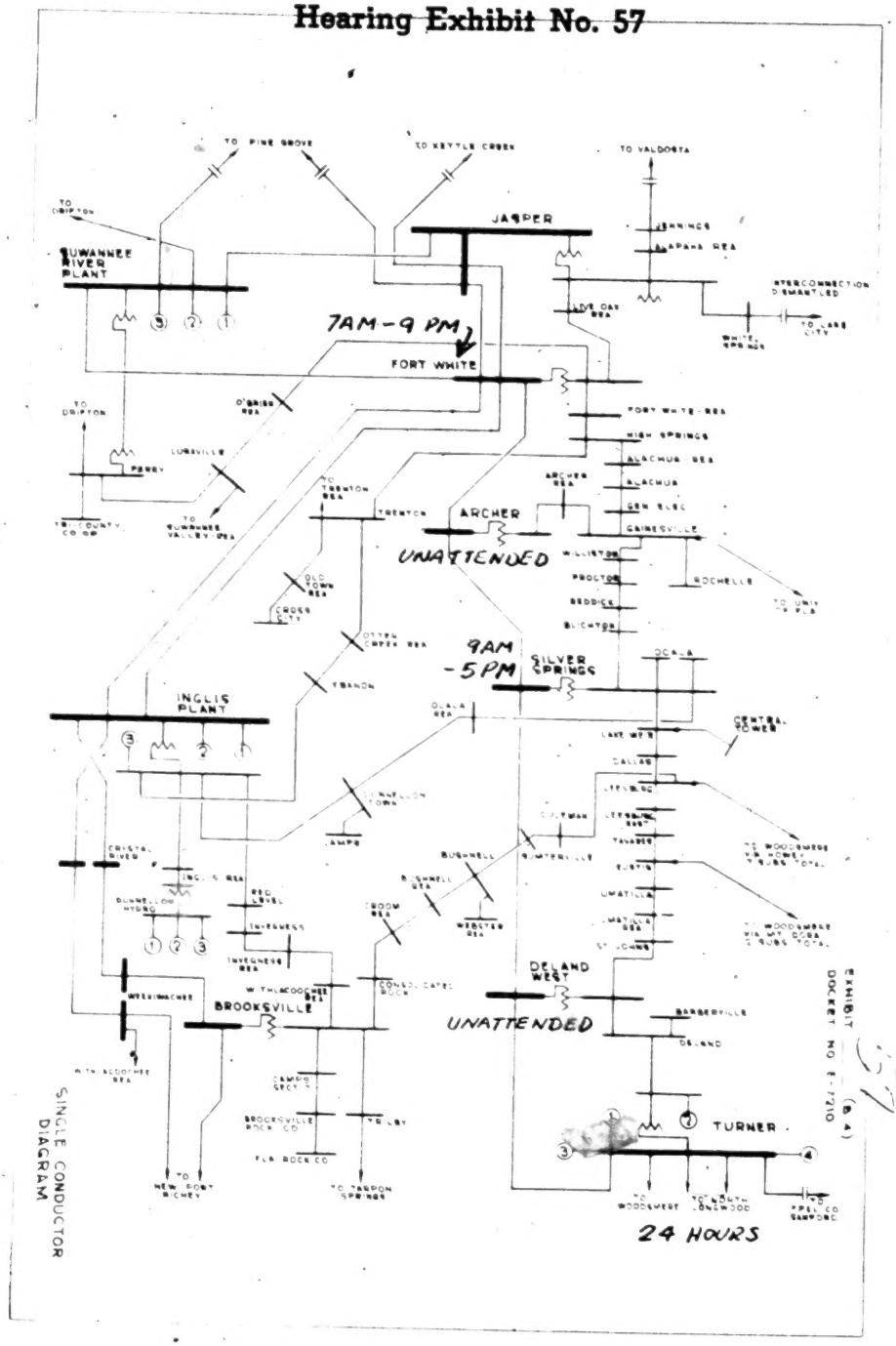
FLORIDA POWER CORPORATION

SYSTEM ONE-LINE SWITCHING DIAGRAM

DRAWN BY ____ DATE 12-30-83
CHECKED BY ____ DATE 12-30-83
APPROVED BY ____ DATE 12-30-83

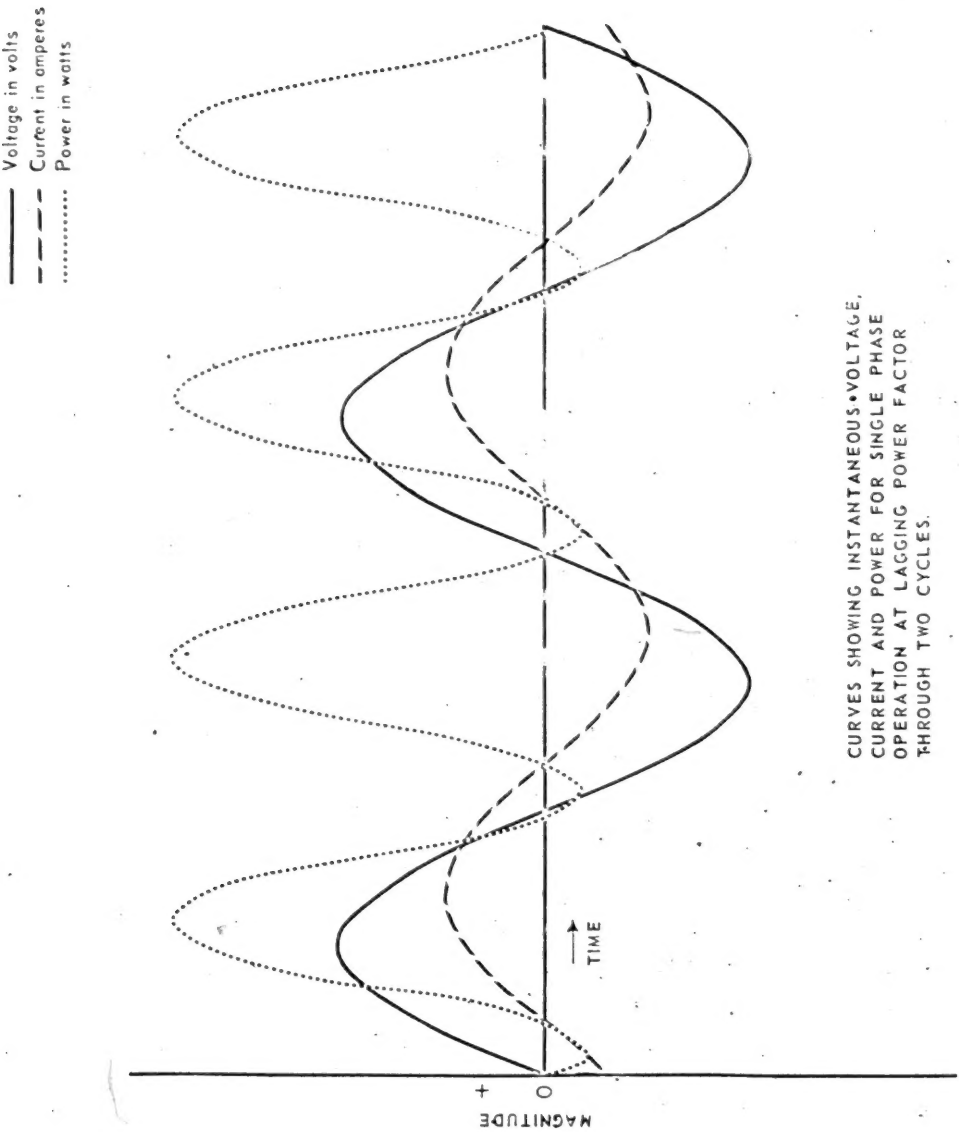
DWG. NO. 6840-D-4-120-2

Hearing Exhibit No. 57



Hearing Exhibit No. 58

Ex. 58

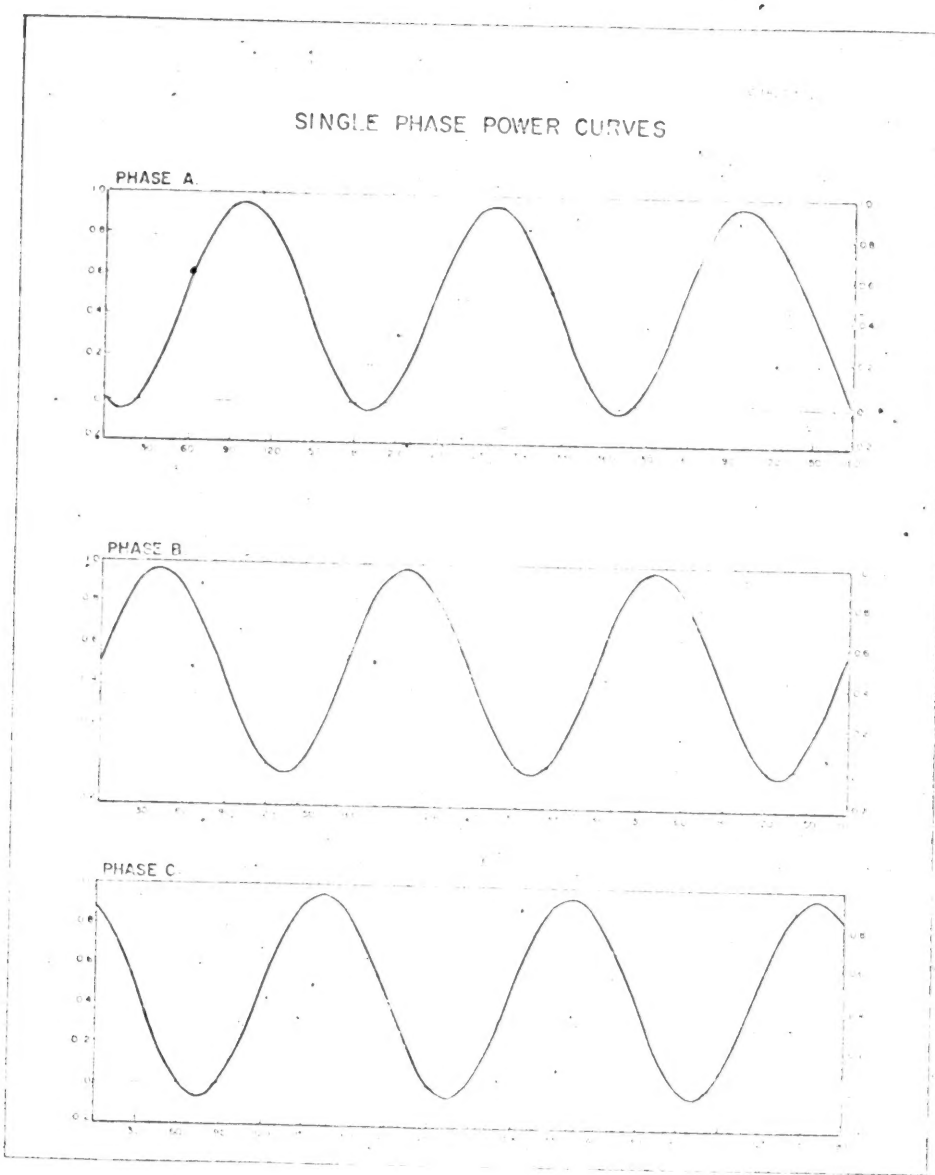


CURVES SHOWING INSTANTANEOUS VOLTAGE, CURRENT AND POWER FOR SINGLE PHASE OPERATION AT LAGGING POWER FACTOR THROUGH TWO CYCLES.

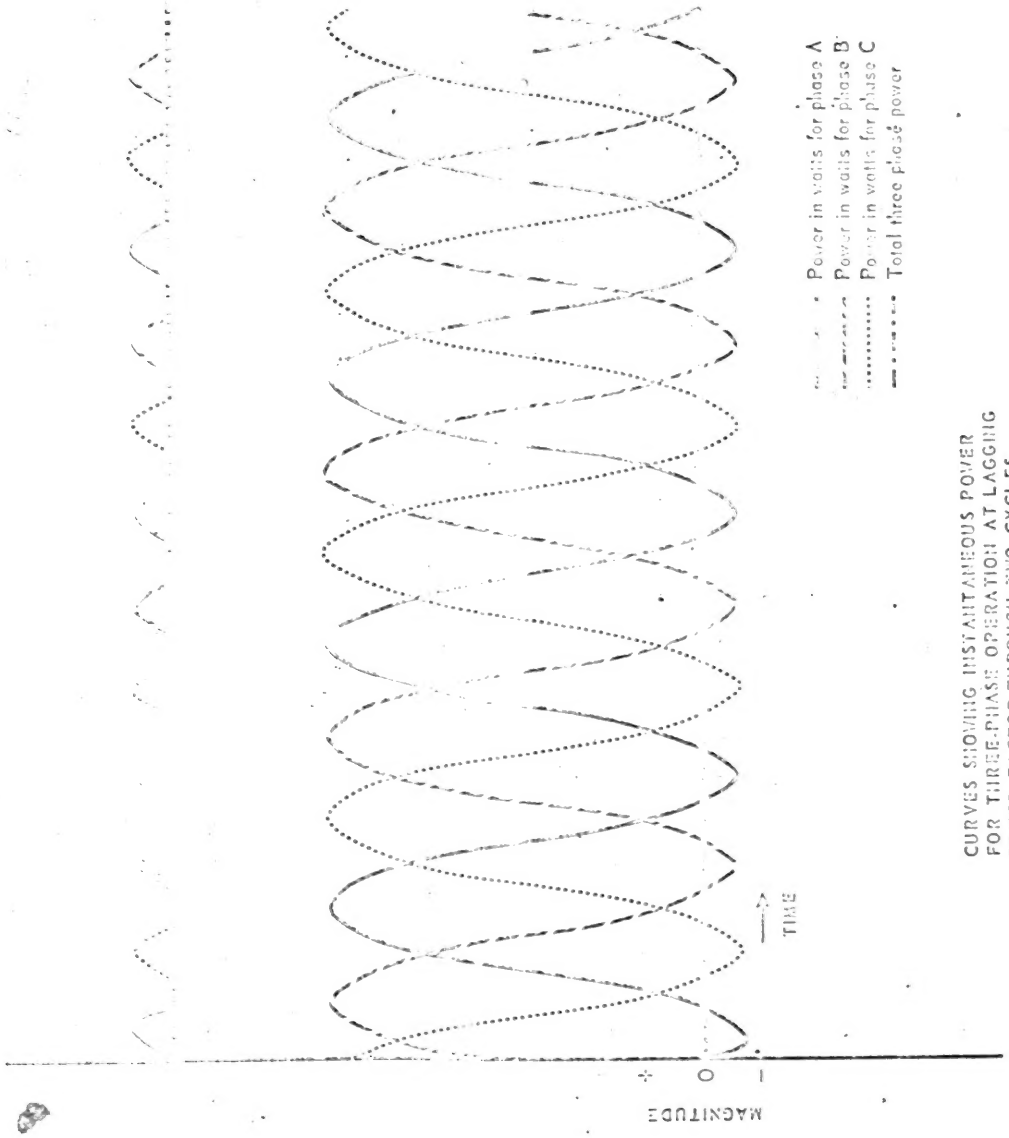
(1252)

Hearing Exhibit No. 59

Ex. 59



Hearing Exhibit No. 60



CURVES SHOWING INSTANTANEOUS POWER
FOR THREE-PHASE OPERATION AT LAGGING
POWER FACTOR THROUGH TWO CYCLES.

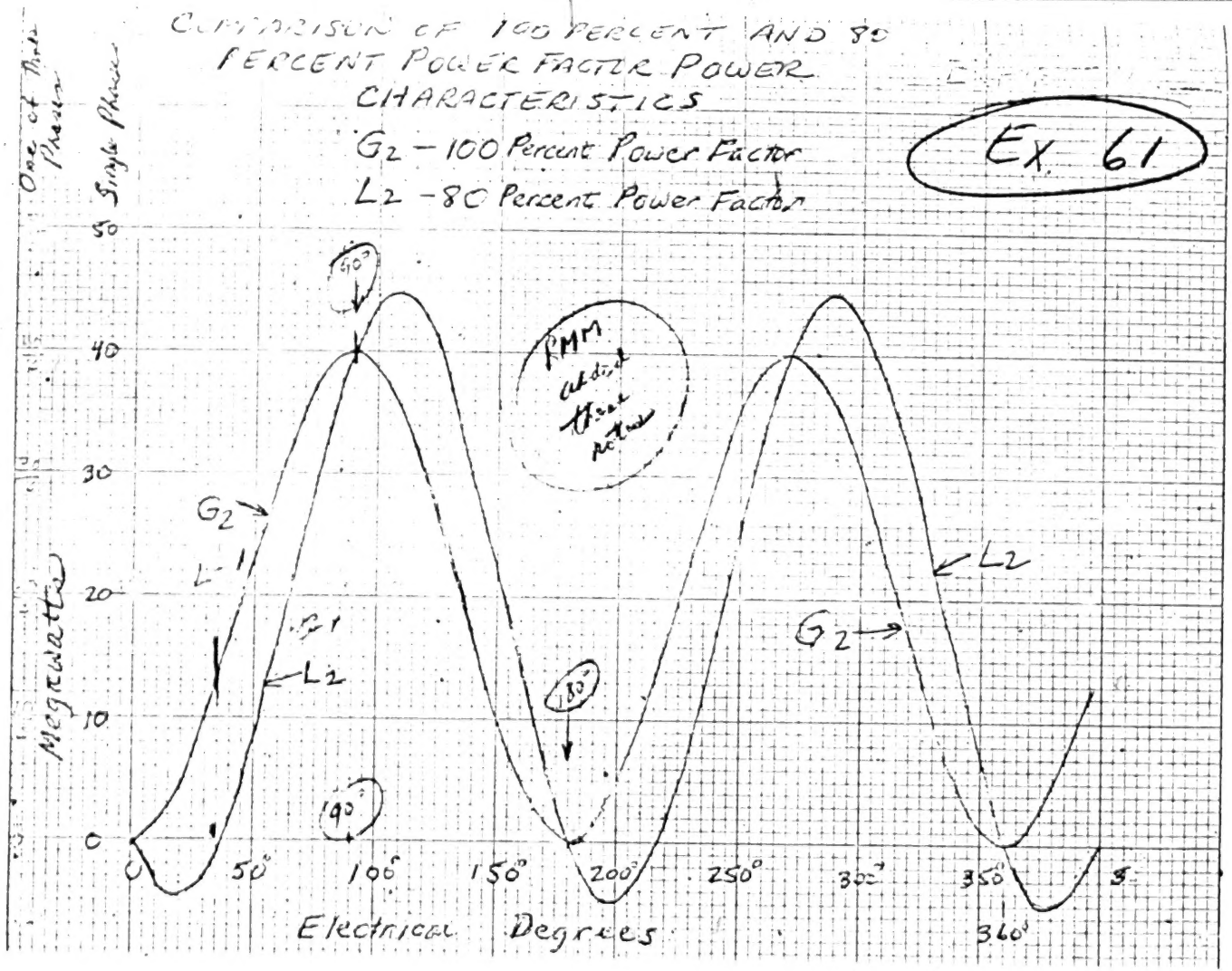
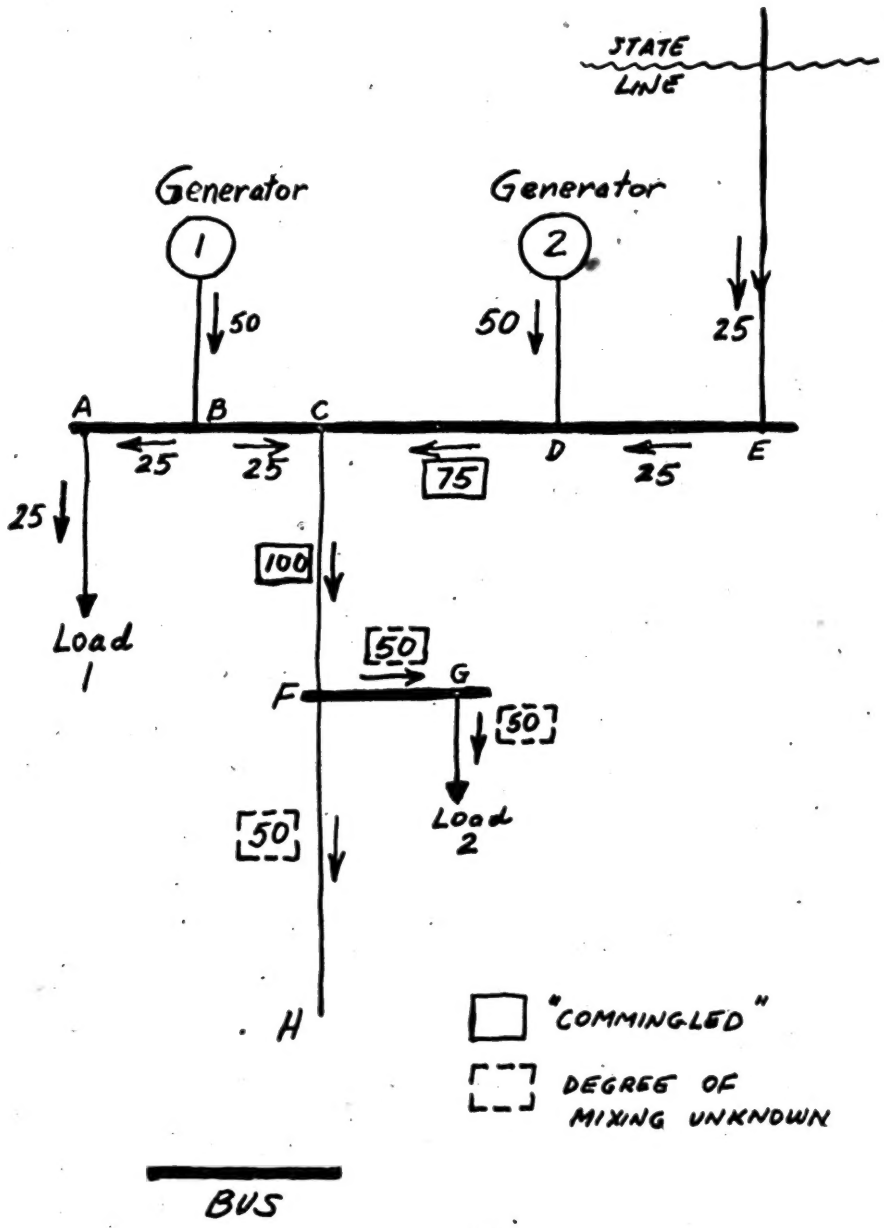

COMPARISON OF 100 PERCENT AND 80 PERCENT POWER FACTOR POWER CHARACTERISTICS
G2 – 100 Percent Power Factor
L2 – 80 Percent Power Factor
EX 61
One of Three Single Phases
Megawatts
50
40
30
20
10
0
G2
L2
60°
90°
30°
PMM
0
50°
100°
150°
200°
250°
300°
350°
360°
Electrical Degrees

Exhibit 69

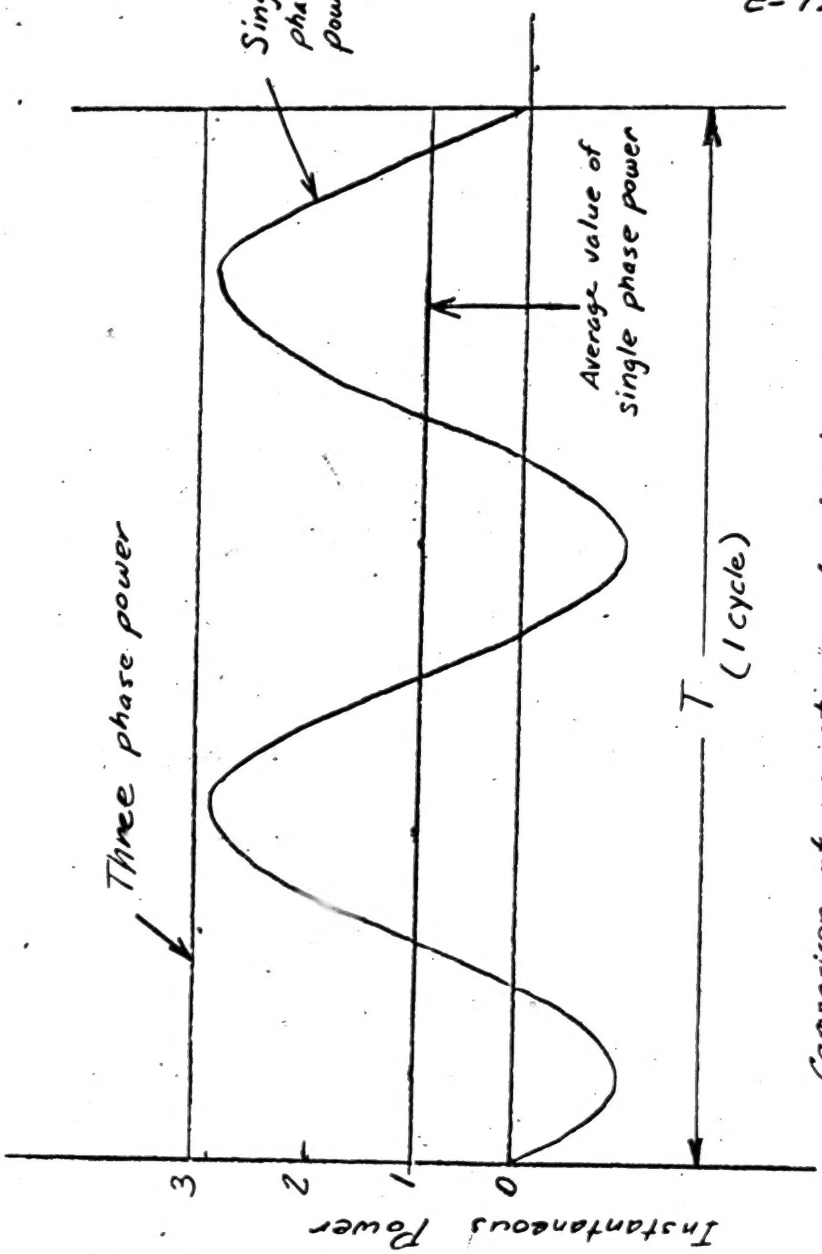
Hearing Exhibit No. 69



(1291-A)

Hearing Exhibit No. 70

Exhibit 70
E-7210



Comparison of variations of single- and balanced three-phase power

INTERCHANGE POWER (Included in Account 555)

1. Report below all of the kilowatt-hours received and delivered during the year. For receipts and deliveries under interchange power agreements, show the net charge or credit resulting therefrom.

2. Provide subheadings and classify interchanges as to (1) Associated Utilities, (2) Nonassociated Utilities, (3) Associated Nonutilities, (4) Other Nonutilities, (5) Municipalities, (6) Cooperatives, and (7) Other Public Authorities. For each interchange across a state line place an "x" in column (b).

3. Particulars of settlements for interchange power shall be furnished in Part B, Details of Settlement for Interchange Power. If settlement for any transaction also includes credit or debit amounts other than for increment generation expenses, show such other component amounts separately, in addition to debit or credit for increment generation expenses, and give a brief explanation of the factors and principles under which such other component amounts were determined. If such settlement represents the net of debits and credits under an interconnection, power pooling coordination, or other such arrangement, submit a copy of the annual summary of transactions and billings among the parties to the agreement. If the amount of settlement reported in this schedule for any transaction does not represent all of the charges and credits covered by the agreement, furnish in a footnote a description of the other debits and credits and state the amounts and accounts to which such other amounts are included for the year.

A. Summary of Interchange According to Companies and Points of Interchange

Line No.	Name of company (a)	Interchanges across State lines (b)	F.P.C. Rate Schedule No. (c)	Point of interchange (d)	KV Voltage at which interchanged (e)	KILOWATT-HOURS Received (f)	KILOWATT-HOURS Del'vered (g)	KILOWATT-HOURS Rec'd. or Net difference (Del'd.) (h)	Net Rec'd. Amount of settlement or (Paid) (i)
1	2) Non-Associated Utilities								$ ¢
3	Fla.Power & Light Co.		-	Lake City,Sanford and Brevard	240,120,69	107 904 000	62 214 000	45 690 000	17 522
5	Tampa Electric Company		-	Oldsmar,Ft.Meade,Winter Haven,Dade City, Mulberry,Pin.Cty.Line	240,120,69	407 933 000	418 459 000	(10 526 000)	5 693
8	Southern Services,Inc.	X	40	Fla.-Ga. State Line, Plt.Scholz&Panama City	120, 69 120	96 869 000 70 607 000	82 182 000 75 142 000	14 687 000 (4 535 000)	(60 960)
10	5) Municipalities								
11	Orlando Util. Comm.		-	Near Orlando	120	50 920 000	81 218 000	(30 298 000)	*(181 023)

B. Details of Settlement for Interchange Power

Line No.	Name of company (j)	Explanation (k)	Amount (l)
12		Florida Power Corporation, Florida Power and Light Company, Tampa Electric Company and the Orlando	$ ¢
13		Utilities Commission have an operating arrangement whereby inadvertent interchange is returned in	
14		kind and cash settlement made only for scheduled interchange between the individual companies.	As Above
15		The Florida Power Corporation and Southern Services, Inc. operate on a pool basis and all energy is	
16		on a KWH returnable basis. A standby charge was paid on a KW basis at one interchange point during	60 960
17		1964. At the end of 1963 Florida Power Corporation owed Southern Services 151,000 KWH, at the end	
18		of 1964 Florida Power Corporation owed Southern Services 10,303,000 KWH, both balances on a return-	
19		able KWH basis. Florida Power Corporation was due 1,000 KWH at the end of 1963 and 12,000 KWH at the	
20		end of 1964 from the other Florida Companies under the operating arrangement for unscheduled power.	
21		All returnable power transactions are recorded on the books @ $.005/KWH and are reflected in A/C 555.	
22		* Includes $150,000 Demand Charge	

Schedule 11

ENERGY TRANSFERRED TO OR ACROSS A STATE LINE OR INTERNATIONAL BOUNDARY DURING THE YEAR

1. In this schedule show the amounts of energy flow to or across a State line or international boundary during the year, including energy to and from the respondent's facilities.

2. Report Total amounts of energy so transferred in each direction over each line used. Do not report Net transfers. Where transfers were made over a number of circuits, estimates (noted "Est."), of the amounts transferred may be furnished, if measured quantities are not available.

3. Where the transfers reported were from one System Company to another System Company operating in an adjoining State, these company names should also be given in columns 1 and 3. "System" companies are those listed under item 6-C, page 3.

Transferred From—		Transferred To—		Line Designation		Amount Transferred (Kilowatt-hours)	
Company (1)	State (2)	Company (3)	State (4)	From— (5)	To— (6)	(7)	
Florida Power Corporation	Fla.	Georgia Power Company	Ga.	Suwannee Plt.-120	Fla.Ga.St.Line	58 547 000	1
				Jasper (1) -120	Fla.Ga.St.Line	9 016 000	2
				Jasper (2) -120	Fla.Ga.St.Line	14 592 000	3
				Jasper (1) - 69	Fla.Ga.St.Line	0	4
				Quincy - 69	Fla.Ga.St.Line	26 000	5
				Monticello - 69	Fla.Ga.St.Line	1 000	6
Georgia Power Company	Ga.	Florida Power Corporation	Fla.	Fla.Ga.St.Line	Suwannee Plt.-120	6 890 000	7
				Fla.Ga.St.Line	Jasper (3) -120	57 511 000	8
				Fla.Ga.St.Line	Jasper (4) -120	35 809 000	9
				Fla.Ga.St.Line	Jasper (3) - 69	6 000	10
				Fla.Ga.St.Line	Quincy - 69	483 000	11
				Fla.Ga.St.Line	Monticello - 69	21 000	12
							13
							14
							15

Power System Statement of FLORIDA POWER CORPORATION for the Year Ended December 31, 19 64

Schedule 16

SYSTEM DEPENDABLE AND ASSURED CAPACITY

INSTRUCTIONS

1 (a). Show as the dependable capacity of the system fuel plants that capacity which can be relied upon to be available for active or standby service at the usual time of the annual system peak. Allowance should be made for any maintenance outage of equipment which MUST be scheduled during the usual time of the annual system peak, giving an explanation under "Remarks." In the space under "Remarks" show what part of the dependable system fuel capacity is suitable only for short-time operation or standby service.

1 (b). The dependable capacity of system hydro plants, as defined for Schedule 16, relates to the capacity which under the most adverse flow conditions of record can be relied upon to carry system load, provide dependable reserve capacity, and meet firm power obligations, taking into account seasonal variations and other characteristics of the load to be supplied and of the firm power obligations. Some systems may be able to utilize off-peak energy from other systems so as to increase the dependable capacity of the reporting system hydro plants. Where consideration is given to the off-peak energy which can be secured from others, an explanation of the amount and conditions governing the receipt of such energy should be given. In cases where the stream-flow records indicate that the most adverse flows are not likely to occur except at long intervals of time and are likely to be of very short duration, the figures used in determining the capacity available from hydro plants may be modified, treating such abnormal limitations as an emergency condition to be covered by the reserve capacity. Such modifications should be fully explained. Full consideration should be given to data reported in Schedule 2 for adverse flow conditions in computing the annual dependable system hydro capacity.

2. Show the amount of firm power which is intended to be available at the usual time of the annual system peak *from* utilities, industries, or others. Show amount stated in contract; if it is not a single, definite, fixed amount, explain under "Remarks" or on a separate sheet. DO NOT INCLUDE POWER WHICH MIGHT BE AVAILABLE UNDER INTERCHANGE, EMERGENCY, OR "WHEN, AS, AND IF" ARRANGEMENTS. It is desired that corresponding items reported be in agreement as between the affected companies. It is, therefore, suggested that the companies concerned agree upon the figures to be reported.

3. Show the amount of firm power committed or obligated which is intended to be available at the usual time of the respondent's system peak *to* other systems. Show amount stated in contract; if it is not a single, definite, fixed amount, explain under "Remarks" or on a separate sheet. DO NOT INCLUDE OBLIGATIONS UNDER INTERCHANGE, EMERGENCY, OR "WHEN, AS, AND IF" ARRANGEMENTS. It is desired that corresponding items reported be in agreement as between the affected companies. It is, therefore, suggested that the companies concerned agree upon the figures to be reported.

5 (a). Show the total amount of reserve capacity, regardless of the source, considered necessary to maintain adequate service at the usual time of the annual system peak, without regard to the relation of net assured capacity to system peak. In general, the largest reduction in dependable capacity which might result from an outage of a generator or boiler unit determines the minimum reserve capacity required. Where unusual conditions obtain, explain fully in the space under "Remarks."

5 (b). Show that portion of the total required reserve capacity which is relied upon to be available at the usual time of system peak under interchange, emergency, or similar agreements with others. In the space under "Remarks" show in detail the sources of this capacity and state what portion is (1) spinning reserve instantly available; (2) available during times of maintenance and inspection; (3) available upon short notice; and (4) length of time available.

5 (c). Show in the space provided for "Remarks" whether the reserve capacity required to be supplied by own plants is available wholly from fuel plants or wholly from hydroelectric plants or a combination of both, and state the length of time this capacity could be depended upon in case of system outages. Some systems having storage hydro may be limited as to the magnitude of load that can be carried by the amount of potential energy available under adverse stream flow conditions. Such systems may have excess peaking capacity, some portion of which can be considered as dependable reserve capacity, provided sufficient energy is held in storage to take care of possible system outages during the critical period. Such capacity should be included in item 1 (b) with full explanation under "Remarks."

If a considerable amount of energy is normally received from or delivered to others (exclusive of deliveries to systems listed in Schedule 8, Part A) under interchange, emergency, or "When, as, and if" arrangements and such transfers are expected to continue, give a brief description under "Remarks." Where firm power obligations or purchases vary in the amount of capacity that is available for any specific period of time or have limitations as to the amount of energy available, full explanation should be given under "Remarks." Use additional sheets for remarks if necessary.

Remarks:

(2) Schedule 16 - Item 5, Part b.

Interconnections with Tampa Electric Company, Florida Power and Light Company, Georgia Power Company and Gulf Power Company provide an emergency interchange capacity of 100,000 kw on short notice, including peak periods.

Power System Statement of FLORIDA POWER CORPORATION for the Year Ended December 31, 19 64

Schedule 16 Continued

SYSTEM DEPENDABLE AND ASSURED CAPACITY

A. CAPACITY AT END OF YEAR COVERED BY THIS REPORT.

Assuming a continuance of the relative seasonal and hourly variations of load that occurred during the year of this report[1], show in item 6, as derived below, what MAXIMUM ANNUAL SYSTEM LOAD could be carried with the system facilities and arrangements for the purchase or sale of firm power as they existed at the end of year covered by this report with allowance for reserve capacity theoretically required (See detailed instructions on page 26)

	Kilowatts	Kilowatts
1. Net dependable capacity available from		
(a) System fuel plants (exclusive of capacity required for station use)	1 147 000	
(b) System hydro plants	10 400	
(c) Subtotal (a) plus (b)	1 157 400	1 157 400
2. Capacity available from firm purchases		
From: Orlando Utilities Commission	100 000	
Total	100 000	100 000
3. Firm obligations to systems listed in schedule 8, part B		
To:		
Total	NONE	NONE
4. Net dependable capacity plus net purchases (1 (c) plus 2 minus 3)		1 257 400
5. Reserve capacity required (exclusive of reserve for load growth)		
(a) Total reserve for system - Largest Unit	219 000	
(b) Available through interchange or emergency agreements[2]	100 000	
(c) Reserve capacity required to be supplied by own system (a) minus (b)		119 000
6. Net assured system capacity (4 minus 5 (c))		1 138 400

B. FUTURE CHANGES IN CAPACITY.

1. List below all SCHEDULED alterations, additions, or retirements in system generating plants, and changes in firm power contracts with other systems.

Description of Change (Give plant name, type of plant and location where applicable) (1)	Date (Month—Year) Start (2)	Date (Month—Year) Completion (3)	Contract Change or Name Plate Rating (Kilowatts) (4)	Effect in Kilowatts on— Net dependable capacity (5)	Effect in Kilowatts on— Reserve capacity (6)	Effect in Kilowatts on— Net assured capacity (7)
Crystal River Plant- Steam	Jan. 1964	July 1966	450 500	421 000	202 000	219 000
Orlando Utilities Comm.	Dec. 1964	Mar. 1966	100 000	100 000	-	100 000
Tampa Electric Company	Sept.1967	Sept.1969	200 000	200 000	-	200 000

2. In addition to the SCHEDULED items in B-1 above, list below all NON-SCHEDULED generating capacity being considered for installation to meet estimated loads reported in schedule 19

Give type of plant and approximate Location, if known (1)	Name-Plate Rating of Unit (Kilowatts) (2)	Number of Units (3)	Estimated Dates— Start Construction (4)	Estimated Dates— In Service (5)
NONE				

1. If the seasonal and hourly variations in load are expected to change materially from those experienced during the year of this report, the information given may be based on the expected load shape, explaining in a footnote.
2. List each source of capacity and the amount available, as specified in Instruction 5 (b) on page 26.

(2231)

Contract

RECEIVED

FLORIDA POWER CORPORATION OCT 24 12 20 PM '63 CONFORMED
St. Petersburg, Florida FEDERAL POWER COMMISSION October 1, 1963

FPC ELECTRIC RATE
SCHEDULE NO. 27
SUPPLEMENT NO. 1
FILING DATE: 10-24-63
EFFECTIVE DATE: Init. Serv. Amt
not before 11-24-63

Southern Services, Inc.
Alabama Power Company
Georgia Power Company
Gulf Power Company
Mississippi Power Company

c/o Southern Services, Inc.
Birmingham, Alabama

Gentlemen:

This letter will serve to confirm the understanding reached between representatives of Southern Services, Inc., acting as agent for the above power companies, and representatives of Florida Power Corporation with respect to a proposed supplement to the Interchange Contract of August 1, 1962, between Florida Power Corporation and Power Companies.

Article VI, "SEASONAL CAPACITY EXCHANGE," Section 6.1, paragraphs (a) and (b), provide that Corporation will make available to Power Companies 100,000 kilowatts of capacity for a period of 92 days beginning on June 16 and that Power Companies will make available to Corporation this same capacity for a period of 92 days beginning December 16. Notwithstanding these paragraphs, it is agreed that, for the summer season of 1966 and the winter season of 1966-67 only:

(1) Corporation will make available to Power Companies 100,000 kilowatts of capacity from June 16 to June 30, 1966, inclusive, and 150,000 kilowatts of capacity beginning July 1 and ending with September 15, 1966; and

(2) Power Companies will make available to Corporation 150,000 kilowatts of capacity beginning December 16, 1966, and ending with March 2, 1967, and 100,000 kilowatts of capacity beginning March 3 and ending with March 17, 1967.

Except as above modified for the period June 16, 1966, through March 17, 1967; all provisions of the aforesaid Interchange Contract of August 1, 1962, shall continue in full force and effect.

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UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

Before Commissioners: Joseph C. Swidler, Chairman; L. J. O'Connor, Jr., Charles R. Ross, and David S. Black.

FLORIDA POWER & LIGHT COMPANY Docket No. E-7210

Order Initiating Investigation and Hearing

(Issued February 26, 1965)

By this order we initiate an investigation of the Florida Power & Light Company to determine whether that company is a public utility subject to regulation under the Federal Power Act.

Florida Power & Light Company (FP&L) is a corporation engaged in the generation, transmission and sale at wholesale and retail of electric energy. It is organized under the laws of the State of Florida and maintains its principal business office in Miami, Florida. By letter of October 3, 1963, the staff of this Commission, having concluded from information before it that FP&L was a public utility within the meaning of Section 201 of the Federal Power Act, requested FP&L to make appropriate filings. In response thereto at a conference on February 14, 1964, and by letter dated April 7, 1964, FP&L denied that it is a "public utility" within the meaning of the Federal Power Act. Subsequent conferences between the Commission staff and representatives of FP&L have failed to resolve the questions of fact necessary for a Commission determination of its status.

From information presently available in the files of the Commission, it appears that FP&L owns and operates an electric generating and transmission system in the State of Florida which is interconnected[1] with electric generating

[1] Information obtained from FP&L's annual reports indicate that these interconnections are being strengthened by new transmission facilities presently under construction.

and transmission systems owned and operated by Florida Power Corporation, Tampa Electric Company, City of Jacksonville, Florida, and Orlando Utilities Commission. Some or all of these systems operate as the Florida Power Pool, which is electrically interconnected with the Georgia Power Company, Gulf Power Company, Alabama Power Company and Mississippi Power Company, which make up the Southern Pool. Considerable exchanges of power between members of the two pools are taking place in interstate commerce on an increasing scale. It appears that FP&L participates in these exchanges and as a result may be a public utility within the meaning of the Federal Power Act. Since, however, FP&L denies that this is the case, an investigation to determine the facts upon a hearing record is necessary and appropriate.

The Commission finds:

In view of the foregoing circumstances, it is necessary and appropriate for the purposes of carrying out the provisions of the Federal Power Act, and particularly, but not in limitation of the foregoing, Sections 201, 208, 301, 307, 308 and 309 (16 U.S.C. §§ 824, 824g, 825, 825f-h) that an investigation and hearing be initiated to determine whether FP&L is a "public utility" within the meaning of, and subject to the requirements of the Federal Power Act.

The Commission orders:

(A) At a time and place and before a hearing examiner to be specified, a public hearing shall be held to find and determine:

(1) Whether FP&L is a "public utility" within the meaning of Section 201 of the Federal Power Act and required to maintain its accounts in accordance with the Commission's Uniform System of Accounts for Public Utilities and Licensees, Part 101 of the Commission's Regulations thereunder;

(2) Whether FP&L maintains its accounts as required by the Commission's Uniform System of Accounts for Public Utilities and Licensees, and if not, what action should be taken by the Commission to insure compliance therewith;

(3) Whether other orders or other actions may be necessary and appropriate to bring about compliance with the Federal Power Act and the Commission's Regulations thereunder.

(B) A prehearing conference shall be held before a presiding examiner commencing at 10 a.m. (EST), April 12, 1965, in a hearing room of the Federal Power Commission, 441 G Street, N. W., Washington, D. C. 20426, for purposes as specified in the Commission's Rules of Practice and Procedure.

(C) In order that the foregoing issues may be properly determined, an investigation is hereby initiated and FP&L is hereby directed pursuant to the provisions of Sections 301(b), 307 and 309 of the Federal Power Act to grant to authorized members of the staff of the Federal Power Commission during regular business hours, free access of its property and access to and the right to inspect and examine all of its accounts, records and memoranda including, but not limited to, the following: books, papers, correspondence, contracts, agreements, maps, reports of engineers, meter readings, and log sheets upon their request; and shall either furnish copies of such material at the request of the staff, or make such material available for reproduction by the staff or shall produce such material for use by the staff prior to and during said hearing at the Offices of the Commission, 441 G Street, N. W., Washington, D. C. 20426.

(D) Notices of intervention or petitions to intervene in this proceeding may be filed with the Federal Power Commission, Washington, D. C. 20426, on or before March 23,

1965, in accordance with the Commission's Rules of Practice and Procedure (18 CFR 1.8 or 1.37).
By the Commission.

(SEAL) JOSEPH H. GUTRIDE,
Secretary.

2490

UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

FLORIDA POWER & LIGHT COMPANY Docket No. E-7210

Presiding Examiner's Initial Decision in Investigation To Determine Jurisdiction

(Issued July 12, 1966)

APPEARANCES

Richard M. Merriman and *Harry A. Poth, Jr.* for Florida Power & Light Company

James L. Graham, Jr. for Florida Public Utilities Commission

George Spiegel for City of Clewiston, Florida

Drexel D. Journey and *Watt N. Martin* for the Staff of the Federal Power Commission

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I

Introduction

Wenner, *Presiding Examiner:* Florida Power & Light Company (Florida) engages in the generation, transmission, and distribution at wholesale and retail of electric energy throughout major portions of Florida. The essential issue in this case is whether Florida is a public utility—whether the Commission has jurisdiction over it under Section 201 of the Federal Power Act. This depends on whether Florida operates facilities for the transmission of electric energy in interstate commerce.

If the Commission has jurisdiction over Florida, Florida is required to maintain its accounts according to the Commission's Uniform System of Accounts; therefore, whether Florida should so maintain its accounts is in issue in this proceeding. But there is not in issue in this proceeding any rate matter. However, if Florida is found to be a public utility, the Commission would have jurisdiction in other proceedings with respect to the rates of such of its sales for resale which are in interstate commerce, and also with respect to compelling its physical interconnection with other systems. But decisions on these matters are not in issue in this proceeding.

II

The Central Issue: Does Florida Transmit Interstate Electric Energy?

The first and indeed the major question in this proceeding is: Does Florida transmit interstate electric energy?

(2492)

There are many significant factors which bear on this issue, but these two are major:

(1) Florida is interconnected with Florida Power Corporation (Corp), another Florida electric utility company. Substantial amounts of electric power are interchanged between Florida and Corp.

(2) Corp is interconnected with Georgia Power Company (Georgia), which operates in Georgia. Substantial amounts of power are interchanged between Corp and Georgia.

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So the question becomes: Is electric energy transmitted between Georgia and Florida via Corp?

We turn to the details of the problem of interstate transmission, considering first the particular interchanges themselves and the interrelationships among the various participants, because these may cast light on the nature of the interstate transmission, if any, and then the question of interstate transmission itself.

III

The Florida System: Independence and Interdependence

Florida provides electric service to the east coast of the state, except for the Jacksonville area and that of five other municipal systems. As of December 1964,[1] it operated ten steam-electric generating plants located in various parts of its system. These are interconnected by a transmission grid of 2,500 miles, of which 1,400 miles operate at high voltage, 115 kv or above. Florida has a net dependable generating capacity of 2.8 million kw.

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1 Unless otherwise noted, all figures are approximate and are for the calendar year 1964.

The generation of electric energy over Florida's system is controlled by a computer in its dispatching office at Miami. Loads on Florida's system constantly change from moment to moment as machines and lights are turned on and off by customers. The computer arranges for load changes to be met by adjusting generation at the various units on Florida's system so that energy to meet the new load is provided in the most economic way. These computer assignments are based on the respective generating unit efficiencies, transmission line losses, and fuel costs at various plants. Under this computer control Florida's system is operated as a unified system, not as a collection of connected plants.

Corp and Tampa Electric Company, both electric companies in the state and which are interconnected with Florida, also operate similar automated systems.

2494

A. *Florida's Independence*

Florida's generating capacity is installed essentially to serve its own loads. In the main, it has adequate generating capacity to meet its own loads. Its plans are based on its continuing, in the main, to supply its own needs in the future.

B. *Florida's Interdependence*

Florida has relationships and is interconnected with four other Florida electric systems, Corp. Tampa Electric Company (Tampa), Orlando Utilities Commission (Orlando), and the City of Jacksonville (Jacksonville).

Florida, Corp and Tampa form the Florida Operating Committee with Jacksonville and Orlando as associate members. The Committee meets several times a year to consider mutual problems relating to the interconnected operation of the systems.

(2494)

The following amounts of electric energy were exchanged during 1964 between Florida, on the one hand, and the other members of the Florida Operating Committee, on the other.

Transferred From Electric Utility System	Transferred to Electric Utility System	Amount Transferred (Kilowatt-hours)
Florida Power & Light Company	Florida Power Corporation	107,642,000
Florida Power Corporation	Florida Power & Light Company	61,598,000
Florida Power & Light Company	Tampa Electric Company	43,081,000
Tampa Electric Company	Florida Power & Light Company	59,404,000
Florida Power & Light Company	City of Jacksonville	17,268,000
City of Jacksonville	Florida Power & Light Company	18,181,000
Florida Power & Light Company	Orlando Utilities Commission	21,431,000
Orlando Utilities Commission	Florida Power & Light Company	59,876,000

As indicated on the table above, power between Florida and each of the other members of the Committee was exchanged in both directions. The electric energy so interchanged by Florida totaled three percent of its net generation of 12 billion kwh.

The energy is interchanged on either a scheduled or inadvertent basis. Scheduled transactions take place after discussion between the dispatchers for each system and are based on the needs of one party and the availability of power on the part of the other, on a "when, as and if basis." During the system peak the five members of the Florida Operating Committee exchange information daily on the amount of spinning reserves each expects to carry. The purpose of the energy interchanges is to take care of temporary needs. There are no economy sales (sales by a company that can produce lower cost power to a higher cost producer) because fuel costs are similar for all members.

2495

There are also inadvertent power flows, the free flow of power that occurs between two interconnected systems

when there is a difference between the angle of the voltage or the magnitude of the voltage on one side of the point of interconnection compared to the other. Inadvertent interchange of energy includes intentional interchange energy resulting from the use of frequency bias as well as unscheduled interchange energy resulting from human or equipment errors.

Interchanges of power are measured, netted, and payment is made for the balance at regular intervals.

In its 1965 Form 12 report Florida lists its reserve capacity at 656,000 kw, 411,000 kw from its own system, and in addition, from the other members of the Florida Operating Committee, "Reserve capacity usually available amounts to 245,000 kw. This is spinning reserve instantly available for emergencies from Florida Power Corporation, Tampa Electric Company, City of Jacksonville and Orlando Utilities Commission." Florida also contributes to the joint reserves of the other members of the Florida Operating Committee.

The arrangements regarding reserves available from the other members of the Florida Operating Committee are not written or firm guarantees. On many occasions the reserve available from each of the members of the Florida Operating Committee has been less than 80% of its allocated share.

The Committee also coordinates the overhaul and maintenance schedules of the five systems so that too many large units are not out of service at a time when they may be needed.

The coordination of reserves, overhaul and maintenance by the Florida Committee is by mutual agreement. The agreements are oral and informal, and are recorded in the minutes of the Committee meetings. There are no sanc-

tions for non-compliance. There is no centralized directorate or administrative nucleus to direct operations. Some other interconnected systems also operate in a similar manner.

C. *The Florida, Corp, Georgia Relationship*

Corp is interconnected with Florida as well as two other members of the Florida Operating Committee, Tampa and Orlando. Corp is also interconnected with Georgia. Thus Corp is interconnected with Florida on the south and with Georgia on the north.

Georgia is a subsidiary of The Southern Company (Southern), a holding company whose other subsidiaries are Gulf Power Company (Gulf) which operates in northwestern Florida, Alabama Power Company (Alabama), and Mississippi Power Company. Corp is interconnected with Gulf, and Gulf is interconnected with Georgia and Alabama. Pursuant to an agreement

between the subsidiaries of Southern, on the one hand, and Corp, on the other, during the summer Corp makes available 100,000 kw to the Southern subsidiaries and during the winter the Southern subsidiaries make available to Corp 100,000 kw. During 1964 Georgia delivered to Corp 97 million kwh and Corp delivered to Georgia 82 million kwh. In addition 3.9 million kwh were wheeled for the Southwestern Power Administration over Southern's lines across the Georgia-Florida state line to Corp. For many days, including peak load periods, there was a flow in both directions during a 24 hour period over the Corp-Georgia interconnection.

Georgia is also interconnected with Duke Power Company, Tennessee Valley Authority, Southeastern Power Ad-

ministration and others. These systems operate in states beyond Georgia.

D. *Florida—A Member of the Interconnected Systems Group*

Florida and the other members of the Florida Operating Committee are members of a multi-state electric network, the Southeast Region of the Interconnected Systems Group (ISG) which covers the southeastern and central portions of the country. Florida operates in synchronism with the 140 members of ISG and is ready to assist them or to receive assistance from them in case of emergency. Thus during a 580 mw generator loss by a midwest utility Florida contributed 8 mw to ISG.

Electric energy transmitted between Corp and Georgia passes through Fort White, a point at the northern part of Corp's system. If power flow exceeds 100 mw at this point the ties open, cutting off the power. Hence assistance between Florida and ISG via the Corp-Georgia interconnection cannot be relied on where the need exceeds 100 mw. However 12 of Florida's 24 generating units generate 75 mw or less. An outage of any of these units would lead to almost instant ISG assistance to Florida. However, no such limitation appears applicable to assistance from ISG via the Florida-Corp-Gulf-Georgia interconnections.

E. *Conclusion*

Florida is operated, to a large extent, as an independent company. It is also an operation which is interconnected with and interdependent with other Florida electric companies. In turn one of these other companies, Corp, is interconnected with and interdependent with Georgia which in turn is interconnected with and interdependent with a network of electric systems operating in many states. The situation and relation of Florida to these other systems

provides the background for the transmission of energy among them.

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IV

The Electromagnetic Unity of Florida, Corp, Georgia, and the Transmission of Interstate Electric Energy by Florida

Under Section 201 (c) of the Act electric energy is transmitted in interstate commerce if transmitted from a State and consumed at any point outside thereof within the United States. Granted that electric energy is transmitted between Florida and Corp, and between Corp and Georgia, the question is posed: Is electric energy transmitted to Florida from Georgia or to Georgia from Florida? The answer depends on what constitutes interstate transmission of electric energy.

Electric power on Florida, Corp, and Georgia and all other interconnected systems is supplied as alternating current at a frequency of 60 cycles. Interconnected synchronous operation, or "parallel operation," as that term is used in the industry, requires that the frequency of each system be in synchronism with that of all others in the interconnection. Two or more electric systems cannot (except under special and rare conditions) operate together unless they are in synchronism. This means that the current pulses on these systems, and thus the frequency, coincide exactly; not approximately, but exactly. Birmingham is served by Alabama which is interconnected with Georgia which is interconnected with Corp. Miami is served by Florida which is interconnected with Corp. The frequency of the pulses is exactly the same in Miami and Birmingham, and if it changes to a new value in Birmingham, then it changes to exactly that same value in Miami. The speed of every electric generator on every electric system in an

interconnected group is irrevocably locked to the same frequency. A variation in one affects all.

Tie line bias with frequency control is the technique used to maintain frequency at 60 cycles on interconnected electric systems operating in synchronism, such as Florida, Corp and Georgia, and is also used to match generation with net system load. Bias is the automatic shift of a system's interchange schedule with frequency. The basic function of modern frequency and tie line control is that of regulating total generating output in each individual system or control area in such a way that the total generation will match continuously and as closely as possible the total system load, including schedule load on interconnection ties.

Frequency never remains at 60 cycles—it is always a bit above or a bit below, because the loads are always fluctuating and the generation follows to keep the system load and generation in balance and as close to 60 cycles as possible. Although deviations in frequency almost always occur due to the impossibility of matching instantaneous load variations with rapid changes in generation, it is important for system operation to keep these frequency deviations as small as possible.

2498

The magnitude of the change in instantaneous generation and frequency on an interconnected system will tend to diminish as the distance from the point of load change increases. But a load change at any point will have an effect on the instantaneous generation and frequency at every point on the interconnected systems. These effects can be calculated.

Each generating unit when operating at a speed corresponding to 60 cycles has mechanical energy of rotation stored in its rotating components which is automatically

convertible to electric energy when there is a decrease in frequency and a corresponding drop in revolutions per minute. When a load is added suddenly to an electric system or a generator is taken suddenly out of service, assuming no other changes occur, every generating unit operating on the Florida system and all connected systems almost instantly experience a loss in speed, so that the mechanical energy of rotation of every generator is converted to electric energy. The sum total of the electric energy so obtained through the conversion of mechanical energy of rotation supplies part of the new load or takes the place of some of the lost generation. Thus every connected generator on the entire interconnected system contributes energy to the interconnected system to supply part of the additional load and so maintain the balance between total system generation and total system load. Following this initial reaction, the governor on each generator reacts in accordance with its sensitivity, rate of response, and position in relation to its "dead band" (the area within which a governor will not respond to a change in load), causing additional steam to be applied to the turbines and to speed up the generators thus producing more energy, which in turn increases the speed of all generators, bringing frequency back to normal. As these events occur, the tie line bias of all the systems is operating so that the net interchange of each system with its neighbors will tend to return to the former prearranged level. Because of the tie line bias of each system, the particular system on which the increase actually occurred will eventually increase generation to supply the additional load and the other systems will correspondingly reduce their temporarily increased electric generation.

Changes in load at various points on all systems are constantly occurring, producing changes in frequency throughout all interconnected systems. The resulting changes in

generation of electric energy throughout the interconnected systems reduce the range of the changes in frequency and thus improve the efficiency of operation of the interconnected systems. Thus unnecessary speed-up or slow-down in generating equipment is minimized; clocks keep more perfect time; precision industrial operations are improved; and oscillations between generators are reduced. This is accomplished by the dispersal of the immediate effects of load changes throughout the electromagnetically interlocked generators of the interconnected systems. One of the reasons for the interconnection of systems is the ability of such

systems to promote stability in generation and frequency by dispersing the effects of load changes throughout larger systems. These effects result in a constant swapping and redistribution of loads borne by the various generators throughout interconnected systems.

These changes are worked through quickly. But they occur. And they occur continuously and frequently.

Thus the modern electric system, such as that of Florida and the systems with which it is interconnected, is an ever varying one; loads and generation are constantly varying from moment to moment as lights are switched on and off and as workmen increase or decrease the power in the machines they use in myriad operations.

For any particular loading on an electric system or interconnected set of systems all of the electric energy produced by all the generating units is delivered to the common coordinated and integrated modern transmission system from which all of the customers are supplied. Variations in load at any point cause changes throughout the interconnected electric systems because of the interdependence of the generating sources. All generating units connected

to a common network experience the same changes in frequency and all clocks connected to such a network experience these changes in frequency and maintain the same time.

No attempt is made to control flows in individual lines because the electric energy flows are determined by the electric characteristics of the network. Only the net of flows over all interconnections on a system is controlled by increasing or decreasing generation so as to maintain interconnection schedules and to maintain frequency as closely as possible at 60 cycles. The changes in generation are in response to changes in load and the effects of tie line bias on all the interconnected systems.

The electrical and other characteristics of an electrical network affect the transfers of electric power and energy at points of connection with other interconnected electric systems. The moment to moment distribution of electric power and energy in an electric network is determined automatically by (1) the electric characteristics, namely, resistance, inductive reactance and capacitative reactance of the electric lines and electric facilities; (2) the locations and power outputs of generating units in operation; and (3) the locations of and amounts of power taken by the electric loads. The electric loads on an electric system vary from moment to moment and so does the total generation. Consequently, the transfers of electric power at points of connection of Florida with other interconnected electric systems vary from moment to moment.

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Electric systems, such as Florida, Corp, Georgia, and others normally have no control over the actual transfers of electric power and energy over any particular transmission interconnection with another electric system if there is more than one interconnection. Similarly electric

utilities, such as Florida, Corp, Georgia, and others, normally, have no control over the actual transfers of electric power and energy with any particular electric system if there are interconnections with two or more electric systems, which are also directly or indirectly connected. In each instance this is due to the free flow characteristics of the electric networks. All that is normally controlled by each system is the net of flows over all its interconnections which is brought about through the effects of tie line bias, frequency changes, governor reactions and generator responses thereto.

Thus there is a free flow of power and energy throughout the electric network in which Corp and Georgia participate. There is also a free flow of power and energy throughout the electric network formed by Corp and Florida. And there is a free flow of energy among Georgia, Corp, and Florida.

All 140 members of the ISG operate in parallel. All are interlocked electromagnetically and maintain the same frequency. Each member renders automatic assistance to the other in times of emergency. As previously noted, Florida can receive from or contribute to ISG up to 100 mw. The network formed by all the members of ISG and the tie line bias and frequency control used by member systems provides mutual assistance in maintaining standard 60-cycle frequency, thereby improving the efficiency of operation of all.

Electric systems operating together on an interconnected basis, such as Florida, Corp and Georgia, schedule the amounts of power and energy transactions among themselves on an hour-to-hour basis and each sets on its own net interchange controller the net amount of scheduled transactions. Each system measures the actual transfers at each point of connection with another electric system

and the differences between scheduled transactions and actual transfers are balanced out as soon as practical. In order that the technique may work efficiently all interconnected systems must do their share in adhering to schedules as closely as possible.

In actuality there are substantial differences between the scheduled and actual transactions. The reason is that none of the connected electric systems including that of Florida, Corp, and Georgia has any control over the actual transfers of power at each point of interconnection because of the free flow characteristics of electric networks. All that can be controlled on each system having more than one interconnection with other electric systems is the net of transfers into or out of its own system or area. This is particularly so with

respect to the electric system of Florida because some of the electric systems to which it is connected have connections among themselves.

An electric utility system such as Florida is essentially an electro-mechanical system to which all operating generators on the interconnected network are interlocked electromagnetically. This means that electric generators, under ordinary operating conditions run either at exactly the same speed or at speeds which will result in a frequency of 60 cycles. No operating generator can change its speed by itself as long as it operates connected to the network. All generators connected to the same network must follow each other as to speed and frequency whenever there is a change in frequency, and the frequency of all interlocked generators is always exactly the same.

The electric systems of Florida and all other interconnected systems are essentially alike as to electrical, electromagnetic and electromechanical characteristics. Because

they are alike, it is possible to have presently existing interconnected operations on a very large scale, extending from the Rocky Mountains to the Atlantic Ocean and from the Canadian to the Mexican border.

For all practical purposes electric energy in the form of alternating current is generated as needed because it cannot be stored in electrical form. At any point in time such electric energy is delivered where needed on a system at a speed of about 186,000 miles per second. An interconnected electric system such as that of Florida, Corp, Georgia, and the others to which it is interconnected, automatically requires at constant frequency that at every moment total generation always be equal to total load plus losses; otherwise, there is an unbalance causing a change in frequency. An electric system cannot supply one connected load and not supply another connected load. For any particular loading on an electric system, all of the electric energy produced by all of the generating units is delivered to the common transmission network which acts as a single unit from which all of the customers are supplied. For any change in load or generation, there is an electrical effect through a change in voltage and current at all generators and at all loads.

If a housewife in Atlanta on the Georgia system turns on a light, every generator on Florida's system almost instantly is caused to produce some quantity of additional electric energy which serves to maintain the balance in the interconnected system between generation and load. If sensitive enough instruments were available and were to be placed throughout Florida's system the increase in generation by every generator on Florida could be precisely measured.

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Nobody can say for certain just how electricity is really transmitted. The analogy to a flow of water is metaphorical

only. Does an electron move from one end of a thousand mile wire to another? Or is there only interaction between neighboring electrons or between fields of force? The answer is not important for legal purposes. The significant factors are that Florida's generators are interlocked electromagnetically with Georgia's and that in consequence, Florida's generators increase their production of electric energy almost instantaneously and automatically in response to increases in load on Georgia's system thereby contributing in some measure to the system supply which meets the increased Georgia load, reducing the variation in frequency on the Georgia system, and increasing its efficiency of operation. Without the Florida response the electric reaction on Georgia and the interconnected systems would be different.

The cause and effect relationship in electric energy occurring throughout every generator and point on the Georgia, Corp and Florida systems constitutes interstate transmission of electric energy by, to, and from Florida. It is the electromagnetic unity of response of Florida, Corp, Georgia and other interconnecting systems that constitutes the interstate transmission of electric energy by Florida.

V

Quantity Immaterial

It is settled law that the quantity of interstate energy transmitted is immaterial in determining whether there is interstate transmission for jurisdictional purposes, *Hartford Electric Light Company* v. *F.P.C.*, 131 F. 2d 953, 960 (CA 2), cert. denied, 319 U.S. 741. *Wisconsin-Michigan Power Co.* v. *F.P.C.*, 197 F. 2d 472, 478 (CA 7), cert. denied, 345 U.S. 934.

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VI

Tracing: Its Limitations and Preferred Method

In the preceding portion of this decision it has been found that Florida transmits interstate electric energy. The conclusion is based on cause and effect relationships that are interstate in scope. No effort is made to trace the path of the interstate electric energy.

The nature of electric energy is not clearly understood. It is sometimes described as a field of force or as a jostling motion of electrons. Where electric energy from two sources has combined, there is no way to identify a particular portion with a particular source. Electric energy is unlike a liquid, gas or solid, whose path can be traced by methods such as, dyeing one stream of the liquid, chemical analysis, tracing radioactive atoms.

In certain simple situations it can be proved that electric energy, or at least an undivided part of the whole, comes from a particular source. Thus a load of 100 kw, C, is supplied from a bus[2] which receives 50 kw from each of two sources, A and B. Plainly the load is receiving electric energy from both A and B. The proof here is logical or mathematical. It does not involve knowledge or application of the physics of electric energy. That the energy at C comes from both A and B is both a sufficient and a necessary explanation. However in modern electric systems such as those of Florida, such methods of logical analysis of the raw data are not applicable. There is too much commingling from different sources in the buses, and the

[2] The ordinary three phase bus is a set of three bars which conduct electric energy and to which incoming circuits lead and from which outgoing circuits extend. It is used as a junction to which supplies of electric energy are joined or from which electric energy is divided to supply different loads.

systems are so complex that there are many possible sources which could account for the amount of electric energy at any point. In these circumstances, several explanations may be sufficient but none may possess the uniqueness necessary for proof.

The principal parties to this proceeding presented their case by attempting to prove or disprove the interstate trans-

mission of electric energy between Florida and Georgia by tracing the flow of electric energy. The Staff relied on the commingled method, Florida on the systems study method. On the basis of the commingled method, it can be proved that electric energy is transmitted between Florida and Georgia; on the basis of the systems study method the contrary follows.

What both Staff and Florida do by their respective methods is transpose the complex dynamism of modern alternating current electric systems into simplified models on the basis of numerous assumptions. The crucial difference between the two methods lies in their treatment of a bus and what happens in the bus.

Florida's system studies method treats the bus as having physical dimensions. It replaces each three phase alternating current bus structure by a single conductor bus and uses the point to point tracing principles of direct current circuits with static power sources and with steady state power flows. The method treats the power flow through the bus as constant in value and direction, on the basis that balanced three phase power under steady state conditions is constant in value and direction from instant to instant, and even with some unbalance, the instantaneous three phase power varies only slightly from the average value

and does not change direction. Thus in the systems studies method, the flow of electric energy instant by instant in the bus is treated as constant in magnitude and as being in a single direction. This result is achieved by taking the algebraic sum of the magnitudes and directions of each of the three power phases and using the combined value of three phase power as representative of the power flow.

This unidirectional combined value of three phase power is purely a mathematical concept. In reality there is no such thing as three phase power. The physical reality is that there are power flows in two directions in each of the three phases, and that both the direction and magnitude of the power in each phase change from instant to instant. The use of a combined power value moving in a single direction to represent all the power being supplied to the bus conceals the dynamics of the physical phenomena. And it is the physical reality that is of significance for purposes of this case.

Staff's method of treating the bus as a point, a tank or a reservoir, where all the energy supplied to the bus is commingled, more nearly represents an actual three phase electric power system because it, in effect, allows for the differences, instant to instant, among the electrical characteristics of sources of power supply and loads, and provides for power contributions to electric loads more nearly as they actually take place. It

furnishes a more satisfactory explanation for purposes of this proceeding because it is more in consonance with the physics of transmission of alternating current than the combined constant value unidirectional assumption underlying the system study method.

The systems studies method is used for certain types of engineering studies. For these purposes the use of uni-

directional combined values is satisfactory because all that is desired is a mathematical answer regardless whether it is in consonance with the physical dynamics of the situation. The combining of magnitudes and directions is similar to the technique of averaging. Both are meaningful methods of representing certain aspects of data. Thus average per capita income, can be a useful concept. But on the basis of average per capita income, there are no poor in the United States. The average is not fully descriptive of the reality, which is a range of incomes from poor to rich. Similarly, the combining of magnitudes and direction of each of the three phases does not provide an adequate description of the dynamic phenomena that occur in a three phase bus which serves as a junction for numerous three phase lines.

If tracing is required then the commingled method with its assumptions reflects the physical reality of alternating current systems better than the systems studies method with its assumptions. On the basis of the commingled method of treating the bus as a point, a tank or a reservoir, the transmission of electric energy between Georgia and Florida via Corp can be demonstrated.

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VII

FLORIDA NOT WITHIN LOCAL DISTRIBUTION EXEMPTION

Interstate transmission of electric energy as used in the Federal Power Act was expected to encompass the almost instantaneous electromagnetic reaction throughout interconnected systems. It was realized that generation at any point on interconnected interstate electric systems would tend to result in an electric response throughout connected facilities even to the final consumer. But Congress did not desire to extend federal regulation to local distribution

systems. It therefore included in Section 202 (b) an exemption from federal jurisdiction over facilities used in local distribution. But for this exemption FPC's jurisdiction over the interstate transmission or sale of electric energy would have extended to the local wholesale purchaser and his distributing system. In other words a physical test was first adopted as the standard for interstate electric transmission. But because of the recognition that such a physical standard would by virtue of the technology of electric transmission tend to extend FPC jurisdiction over all interconnected local distribution facilities, Congress found it necessary to limit FPC's jurisdiction by superimposing a legal test: FPC shall not exercise jurisdiction over local distribution facilities.

The reach of interstate transmission is indicated by the Supreme Court in *Connecticut Light & Power* v. *F.P.C.* 324 U.S. 515, at 529-530:

> ". . . This bill [the genesis of Part II of the Federal Power Act] came before Congress as prepared by the staff of the Commission, couched largely in the technical language of the electric art. Federal jurisdiction was to follow the flow of electric energy, an engineering and scientific, rather than a legalistic or governmental, test. Technology of the business is such that if any part of a supply of electric energy comes from outside of a state it is, or may be, present in every connected distribution facility. Every facility from generator to the appliance for consumption may thus be called one for transmitting such interstate. By this test the cord from a light plug to a toaster on the breakfast table is a facility for transmission of interstate energy if any part of the load is generated without the state. It has never been questioned that technologically generation, transmission, distribution and consumption are so fused and interdependent that the

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whole enterprise is within the reach of the commerce power of Congress, either on the basis that it is, or that it affects, interstate commerce, if at any point it crosses a state line . . ."

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Aware of the reach of interstate transmission of electric energy, the Court explained that Congress had imposed an express limitation on FPC's jurisdiction in the form of a separate legal test (324 U.S. at 531):

". . . . To define the scope of state controls, Congress employed terms of limitation perhaps less scientific, less precise, less definite than the terms of the grant of federal power. The expression 'facilities used in local distribution' is one of relative generality. But as used in this Act it is not a meaningless generality in the light of our history and the structure of our government. We hold the phrase to be a limitation on jurisdiction and a legal standard that must be given effect in this case in addition to the technological transmission test . . ."

What is the scope of the local distribution exemption? Local distribution begins where high voltage bulk power is reduced to low voltage for the wholesaler who distributes to the local consumer. Thus the Supreme Court stated in *United States* v. *Public Utilities Commission of California*, 345 U.S. 295 at 316:

". . . The sales were made in California but the facilities supplied 'local distribution' only after the current was subdivided for individual consumers . . ."

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The same application of the local distribution test was made in *Wisconsin-Michigan Power Co.* v. *F.P.C.*, 197 F. 2d 472

(CA 7), cert. denied, 345, U.S. 934; where the Court stated (197 F.2d at 477):

> "... The question is essentially, when does interstate commerce transportation end and where do the local distribution facilities first become operative. We have seen that the power is transmitted from state to state. In the Wisconsin operation, it comes to Stiles in that state by means of the main transmission line from Michigan and there a transformer reduces it in voltage. It then proceeds in transmission over the lower voltage line to still other points where again the voltage is reduced; eventually it comes to the plants of the wholesalers. Thus the interstate transmission of electric energy continues from Michigan through the transformers in reduced voltage to the wholesaler; upon delivery to him local distribution begins when he resells. His sales and distribution at retail are clearly local in character, and constitute only local distribution; but at no point before delivery to him has been completed, has interstate transmission terminated. In other words 'facilities used in local distribution' means facilities used for making resale and distribution to consumers, jurisdiction over which is left to the states . . . We think there is no ground for the position that local distribution includes any transmission occurring before the wholesaler who resells at retail is reached . . ."

Florida has a transmission grid of 2,500 miles, of which 1,400 are high voltage, 115 kv or above. There are 1,100 miles of transmission facilities used for local distribution. The 1,400 miles of high voltage lines are anterior to distribution to local consumers and are not "facilities used in local distribution."

In *Connecticut Light & Power Co., supra,* the facility of Connecticut Light on which jurisdiction was claimed to rest

was a step-down transformer at the Company's substation at Bristol, an isolated segment of its system. The distribution facilities from the Bristol substation to individual consumers were concedely within the local distribution exemption. A connecting system which received some interstate power had an extension which supplied the power to the Bristol substation which reduced the voltage prior to distribution to the consumers. The step-down transformer in the substation was the only facility of Connecticut

Light that did not plainly fall within the local distribution exemption. The Supreme Court remanded the case to the Commission to determine whether the transformer performed the last stage in interstate transmission or the first stage in local distribution. In the instant case there is no such problem. Florida's 1,400 miles of high voltage transmission lines are used to transport bulk power and are not part of the facilities used to distribute the power to local consumers. Florida therefore has facilities which are not within the local distribution exemption, and which transmit interstate electric energy.

VIII

EXERCISE OF JURISDICTION

As a public utility under the Act, Florida would be required to keep its accounts in accordance with the Commission's Uniform System of Accounts for Public Utilities. Florida presently files the Commission's principal reports, FPC Form No. 1, Annual Report, and No. 12, Power System Statement. It maintains its books of account in accordance with the NARUC (National Association of Railroad and Utilities Commissioners) system of accounts which are similar to those of the Commission's Uniform System of Accounts. Florida reclassified its plant accounts for the Securities and Exchange Commission in 1942 on an original

cost basis. It has been keeping its accounts on that basis at least since 1951. So conforming to the Commission's accounting requirements would not be burdensome.

A second factor is the Commission's jurisdiction over the interconnections of public utilities. A facet of this problem is illustrated by the situation regarding the Intervenor City of Clewiston.

Clewiston is three miles from Florida's Ranch-Fort Myers transmission line. Clewiston owns and operates its own distribution plant. It presently purchases its electric supply from U. S. Sugar Corporation, which in turn purchases Clewiston's requirements from Glades Electric Cooperative, Inc. Glades purchases its power from Florida three miles from Clewiston. Clewiston seeks to purchase directly from Florida. Direct service to Clewiston by Florida would save the City $100,000 per year.

In 1952 Clewiston and U. S. Sugar sought jointly to obtain power for the summer months. Florida stated its willingness to sell power to U. S. Sugar, but was not willing to permit the power to be resold to Clewiston.

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In 1954 Clewiston requested direct service from Florida at wholesale. This was refused on the grounds that this was contrary to company policy, that it would not sell to a municipal at wholesale except in the case of furnishing an emergency supply. As an alternative, Florida proposed to lease Clewiston's distribution system and sell directly at retail within the City. This counter-proposal was rejected by the City Commission.

In 1957 Clewiston again requested that Florida sell directly to it. Florida stated in essence that Clewiston's request was rejected, but that it would be willing to buy out the system and sell at retail within the City. The City

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turned down this counter-offer, and as a result, was unable to purchase power from Florida. At this conference, Florida restated the same company policy as was stated in the 1954 negotiations.

In 1962 Clewiston again requested a direct power supply from Florida. Florida stated, in essence, that its policy had not changed and it would therefore not sell to Clewiston at wholesale.

In July 1965 Clewiston requested a direct wholesale supply from Florida at the same rates as Florida was using for its sales to Glades, the rural electric cooperative which was reselling Florida power to U.S. Sugar which in turn was selling to Clewiston. Florida stated in essence that the company policy had not changed, and that it would not sell to Clewiston.

In a September 1965 conference Florida's president stated in essence that the company policy regarding selling power to municipalities had not changed, but could change. He would propose to Florida's Board of Directors that if the City of Clewiston would agree to have a referendum to see if the City would sell its distribution system to Florida or should continue to operate it, and the City Commission would be bound by this referendum, Florida would sell directly to the City if the referendum vote were in favor of City ownership. Florida also stated, in essence, that the rates would not necessarily be as low as the rates to Glades, and that this would have to be worked out. Clewiston informed Florida that if Florida would submit a written proposal it would be presented to the City Commission for appropriate action.

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If Florida be held to be a public utility, the Commission has power under Section 202 (b) of the Act to direct that it

interconnect with Clewiston if, after hearing, it finds this to be in the public interest and not an undue burden upon Florida. Clewiston in Docket No. E-7243 filed an application for such action; however on July 6. 1966, the Commission granted a motion by Clewiston to dismiss this proceeding on the grounds that pursuant to an agreement among Glades, Clewiston and U. S. Sugar, Glades will sell directly to Clewiston at rates representing a reduction of $140,000 from the rates Clewiston formerly paid to U. S. Sugar. This result apparently satisfies Clewiston's immediate objectives. But it does not dismiss the matters and principles raised by Clewiston in the instant proceeding. A finding of jurisdiction herein would enable the Commission to take action with respect to similar problems if they should arise and if such a step should be found appropriate.

Another aspect of the interconnection problem concerns Florida's participation in ISG and its interconnection with 140 electric utility systems throughout the southern and central United States. All these systems operate in parallel and are interlocked eectromagnetically. All are interdependent to some extent. The Northeast Power Failure of 1965 suggests the reach of such interdependence. It is expedient that FPC's exercise of jurisdiction which it is otherwise found to possess under the Act be in consonance with the reach and realities of modern interconnected electric systems.

IX

CONCLUSION

It is further found and concluded:

(1) Florida Power & Light Company, a corporation organized and existing pursuant to the laws of the State of Florida, owns and operates facilities, among others, for the transmission of electric energy transmitted from points

of generation in the States of Georgia and Florida to points of consumption outside the State in which it is generated, which facilities are in addition to, and do not include, facilities used for the generation of electric energy, facilities used in local distribution or only for the transmission of electric energy in intrastate commerce, or facilities for the transmission of electric energy consumed wholly by the transmitter.

Florida Power & Light Company is, therefore a public utility within the meaning of that term as used in Section 201 of the Federal Power Act and subject to the jurisdiction of the Commission.

(2) Florida Power & Light Company, as a public utility under the Federal Power Act, is obligated, *inter alia,* to file with the Federal Power Commission original cost statements in the manner provided in Section 120.3 of the Commission's Regulations under the Federal Power Act and Electric Plant Instruction No. 1 of the Commission's Uniform System of Accounts Prescribed for Public Utilities and Licensees Subject to the Provisions of the Federal Power Act.

ORDER

WHEREFORE, IT IS ORDERED that within ninety days from the date of this decision Florida & Light Company comply with all requirements of the Commission's Regulations under the Federal Power Act, including the Uniform System of Accounts Prescribed for Public Utilities and Licensees Subject to the Provisions of the Federal Power Act.

/s/ SEYMOUR WENNER
Seymour Wenner
Presiding Examiner

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UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

FLORIDA POWER & LIGHT COMPANY Docket No. E-7210

Opinion and Order Determining Jurisdiction

Issued: March 20, 1967

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2628

Opinion No. 517

APPEARANCES

Richard M. Merriman and *Harry A. Poth, Jr.* for Florida Power & Light Company.

James L. Graham, Jr. for Florida Public Utilities Commission.

George Spiegel for City of Clewiston, Florida.

Drexel D. Journey and *Watt N. Martin* for the Staff of the Federal Power Commission.

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Before Commissioners: Lee C. White, Chairman; L. J. O'Connor, Jr., Charles R. Ross, Carl E. Bagge, and John A. Carver, Jr.

WHITE, *Chairman:*

This is a proceeding to determine whether the Florida Power & Light Company (FPL) is a public utility within the meaning of Section 201 of the Federal Power Act, and whether it should be required to maintain its accounts in accordance with the Commission's Uniform System of Accounts for Public Utilities and Licensees.

The Commission instituted the investigation in this docket on February 26, 1965. The Florida Public Service Commission (Florida Commission) filed notice of intervention dated March 17, 1965, and thereafter the City of Clewis-

ton, Florida (Clewiston), was granted limited intervention.[1] Hearings were held on October 4, 5, 7, 8, and 12, 1965, and again on November 3, 1965. On July 12, 1966, the Presiding Examiner, Seymour Wenner, issued an initial decision in which he found that FPL owns and operates facilities, among others, for the transmission of electric energy transmitted from points of generation in the States of Georgia and Florida to points of consumption outside the state in which it is generated, and therefore is a public utility under Section 201 of the Act, subject to the Commission's jurisdiction.

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He further held that FPL must file original cost statements as provided in the Commission's Uniform System of Accounts Prescribed for Public Utilities and Licensees Subject to the Provisions of the Federal Power Act, and that it must comply with all other requirements of the Commission's Regulations under such Act.

The proceeding is before the Commission on the examiner's decision, exceptions filed by FPL and the Florida Commission, and staff's opposition to these exceptions. FPL and the Florida Commission contend that there is no substantial evidence in the record to support the examiner's finding that FPL transmits electric energy in interstate commerce, and they urge that the Commission, in the exercise of its discretion, should in any event decline jurisdiction over FPL. Oral argument was held before the Commission on November 28, 1966.

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1 On September 7, 1965, Clewiston filed a complaint in Docket No. E-7243, requesting that the Commission order FPL, pursuant to Section 202(b) of the Act, to connect its facilities with those of Clewiston and render direct wholesale service at reasonable rates. After the hearings, Clewiston negotiated a rate settlement with its power suppliers (U.S. Sugar Corporation and Glades Electric Cooperative, Inc.), and moved for the dismissal of its application in Docket No. E-7243. The motion wos granted on July 6, 1966.

For the reasons set forth below we find that FPL's and the Florida Commission's exceptions are not persuasive and do not warrant our reversal of the examiner's decision. It is our opinion that the basic findings of fact and the conclusions of law in the examiner's comprehensive initial decision are fully supported by the evidence of record, and that these findings and conclusions, as supplemented by our discussion herein, should be approved. We agree with the examiner that FPL owns and operates facilities for the transmission of electric energy in interstate commerce, that these facilities do not fall within the local distribution exemption provisions of Section 201(b) of the Federal Power Act, and that FPL must file original cost statements and comply with all other requirements of the Commission's Regulations under such Act.

Inasmuch as the examiner's decision sets forth in detail the factual background of this proceeding and the legal principles applicable thereto, we shall not recite the factual details in full, but shall refer essentially to those raised by FPL and the Florida Commission in their exceptions.

The record shows that FPL is engaged in the generation, transmission, distribution, and sale at wholesale and at retail of electric energy in the State of Florida. It is

the largest electric utility in the state, with a net dependable generating capacity of 2.8 million kw, and it supplies service to about 931,400 customers in more than 500 cities, rural communities and adjacent areas. As of December 1964,[2] it operated ten steam-electric generating plants interconnected by a transmission grid of 2,500 miles, of which

[2] Unless otherwise noted, the figures stated are approximate and are for the calendar year 1964.

1,400 miles operate at high voltage, 115 kv or above. On the basis of national standing, FPL is one of the most important electric utilities in the United States. In 1965 its rank was ninth nationally in revenues, fourteenth in investment in gross electric utility plant, and sixteenth in kilowatt hour sales.

FPL is directly interconnected with four other Florida electric systems, as follows: Florida Power Corporation (Corp), Tampa Electric Company (Tampa), Orlando Utilities Commission (Orlando), and the City of Jacksonville (Jacksonville). FPL, Corp, and Tampa form the Florida Operating Committee (Florida Pool) with Jacksonville and Orlando as associate members. The Florida Pool meets several times a year to consider mutual problems relating to the interconnected operation of the systems, including the coordination of spinning reserves, the arrangement of compatible plant maintenance schedules, and the coordination of plans for the construction of transmission lines and the staggered construction of generating units. The spinning reserves of the Florida Pool equal the generating capacity of the largest single unit of the five-member systems, and by voluntary agreement of the members, are shared proportionally. According to FPL's reports in its FPC Form No. 12 for 1964, its required reserve capacity for that year was 404,000 kw, of which amount it supplied 172,000 kw. The balance of 232,000 kw was reported as being available from the other members of the Florida Pool.

FPL exchanges a substantial amount of electric energy with the other members of the Florida Pool. During 1964 FPL transferred a total of 189,422,000 kwh to the four other

Pool members, and received in return a total of 199,059,000 kwh, itemized as follows:

Kwh Transferred from FPL to:		Kwh Transferred to FPL from:	
Corp	107,642,000	Corp	61,598,000
Tampa	43,081,000	Tampa	59,404,000
Jacksonville	17,268,000	Jacksonville	18,181,000
Orlando	21,431,000	Orlando	59,876,000

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The electric energy interchanged by FPL in 1964 totaled three percent of its net generation of 12 billion kwh.

Corp, which is interconnected with Tampa and Orlando as well as with FPL, is also interconnected with power companies outside of the State of Florida. Thus, it is directly interconnected with Georgia Power Company (Georgia), a subsidiary of The Southern Company (Southern). Southern is a holding company whose other subsidiaries are Gulf Power Company (Gulf) which operates in northwestern Florida, Alabama Power Company (Alabama), and Mississippi Power Company (Mississippi). Corp is also directly interconnected with Gulf, and Gulf is interconnected with Georgia and Alabama. Corp has an agreement with the subsidiaries of Southern whereby Corp makes 100,000 kw available to these subsidiaries during the summer, and in return, the subsidiaries make 100,000 kw available to Corp during the winter. During 1964 Southern delivered 167,476,000 kwh to Corp, and Corp delivered 157,324,000 kwh to Southern. Of these totals, approximately 97,000,000 kwh represented deliveries from Georgia to Corp, and 82,000,000 kwh represented deliveries from Corp to Georgia. In addition, 3.9 million kwh were wheeled for the Southwestern Power Administration over Southern's lines across the Georgia-Florida state line to Corp. Georgia is also

interconnected with Duke Power Company, Tennessee Valley Authority, and Southeastern Power Administration. These systems operate in states beyond Georgia.

FPL and the other members of the Florida Pool are also members of a multi-state electric network, the Southeast Region of the Interconnected Systems Group (ISG) which covers the southeastern and central portions of the United States. FPL's membership in the ISG provides acceptable frequency control and also automatic assistance during emergencies in the event of any generation outage of less than 100 mw on its system. In this connection it may be noted that 12 of FPL's 24 generating units generate 75 mw or less. An outage of any of these units would lead to almost instantaneous assistance to FPL. FPL, in turn, operates in synchronism with the 140 members of ISG and is ready to assist them in case of emergency. Thus, FPL contributed 8 mw to ISG to assist a midwestern utility which had sustained a 580-mw generator loss.

The testimony and evidence of record support the examiner's findings that the electric power on all the interconnected systems in which FPL, Corp, and Georgia participate is supplied as alternating current at a frequency of 60 cycles; that the frequency of each system is in synchronism with that of all the others in the interconnection; that there is a tie-line bias with frequency control on the interconnected systems which permits a free flow of power and energy throughout the networks in which FPL, Corp, and Georgia participate; that all 140 members of the ISG operate in parallel and are interlocked electromagnetically; and that FPL can receive from or contribute to ISG up to 100 mw. The record further supports the examiner's findings that FPL normally has no control over the actual transfers of electric power and energy with any particular elec-

tric system with which it is interconnected; that since electric energy can be delivered virtually instantaneously when needed on a system at a speed of 186,000 miles per second, such energy can be and is transmitted to FPL when needed from out-of-state generators, and in turn can be and is transmitted from FPL to help meet out-of-state demands; and finally, that there is a cause and effect relationship in electric energy occurring throughout every generator and point on the FPL, Corp, Georgia, and Southern systems which constitutes interstate transmission of electric energy by, to, and from FPL.

In its exceptions FPL argues that there is no substantial record support for the examiner's finding that it is engaged in the transmission of electric energy in interstate commerce. We find no merit in this argument. The examiner concluded that the operation of FPL in electromagnetic unity with the suppliers in and outside of Florida in and of itself demonstrated that it owned and operated facilities for the interstate transmission of electric energy. This finding is also supported by the evidence produced by staff at the hearing which convincingly establishes that electric energy is transmitted in interstate commerce to and from FPL's lines. The nature of staff's showing is fully consistent with, and satisfies the tests which we have established in numerous opinions issued in the last two years to support a finding that wholesale

sales are in interstate commerce. See *Indiana & Michigan Electric Company,* Opinion No. 458, 33 FPC 739, *affirmed Indiana & Michigan Electric Company* v. *Federal Power Commission,* 365 F. 2d 180 (CA 7), *certiorari denied* 385 U.S. 972; *Arkansas Power & Light Company,* Opinion No. 473, 34 FPC 747 (1965), *affirmed Arkansas Power & Light Company* v. *Federal Power Commission,* 368 F. 2d 376 (CA

8); *Public Service Company of Indiana, Inc.*, Opinion No. 483, — FPC — (1965), *affirmed* in *Public Service Company of Indiana, Inc.* v. *Federal Power Commission*, — F. 2d — (CA 7, January 13, 1967); the *Cincinnati Gas & Electric Company*, Opinion No. 485, — FPC — (1966). Certainly it is reasonable to rely on the methodology used in the above cases to demonstrate that particular sales are in interstate commerce to establish in this proceeding that FPL itself is engaged in the interstate transmission of electric energy and is thus a "public utility" within the meaning of the Act.

Thus through the application of the same techniques here that it had utilized in those other cases staff demonstrated by its record exhibits the flow of energy from Georgia across the Georgia-Florida state line through Corp's system and into FPL's transmission lines, as well as a reverse flow from FPL's lines through Corp's system to Georgia. See Staff's Exhibit Nos. 18, 19, 32, and 33.[3] For example, Staff's Exhibit No. 18, at page 6, graphically demonstrates that on September 28, 1964, at 7:00 o'clock p.m., there was a flow of 51,000 kw of interstate power from Georgia to Corp and an instantaneous flow of 50,000

kw of commingled interstate and intrastate power from Corp to FPL. We are not persuaded by FPL's exceptions that the examiner committed error in basing his findings on such staff exhibits rather than on FPL's own system studies

[3] Staff's Exhibit No. 18 shows the flow of energy from Georgia through Corp's system and into FPL transmission lines via the Jasper-Fort-White-Turner-Sanford interconnections on designated hours of 22 days out of a 4-month period in 1964. Staff Exhibit No. 19 indicates the presence of such flows during hours earlier than 7:00 a.m. on 20 of the 22 days listed in Exhibit No. 18. Staff Exhibit No. 32 further shows that energy transmitted from FPL's Sanford Plant flowed during 3 days of the same 4-month period over Corp lines into the Georgia Power System via the Turner-Fort-White-Jasper interconnections.

which FPL contends show that no Georgia energy can enter the FPL lines and that no FPL energy can flow as far north as Georgia.

As ably explained by the examiner, the power flow studies prepared by staff all rest on the concept that there is a commingling of energy from different sources at a bus with the result that the energy which flows away from such bus is so fully commingled as to consist of energy which has entered such bus both from interstate and intrastate sources. Staff recognizes that energy flows to and from a bus as three-phase alternating current, and staff treats a bus as a point, or a tank, or a reservoir where all the energy supplied to the bus is commingled. The studies prepared by FPL, on the other hand, treat the bus as having physical dimensions, and replace each three-phase alternating current bus structure by a single conductor bus. FPL uses the point-to-point tracing principles of direct current circuits with static power sources and with steady state power flows. This steady state method treats the power flow through the bus as constant in value and direction, on the basis that balanced three-phase power under steady state conditions is constant in value and direction from instant to instant. Although FPL's method may lend itself to a theoretical showing of energy flow which may demonstrate that energy will flow from a certain source to a certain load,[4] this method does not fully or accurately reflect the actual operation of a bus, and it does not show the physical reality

[4] The steady state method was used to establish the fact of such a flow in *City of Colton, California* v. *Southern California Edison Company*, Opinion No. 346, 26 FPC 223, 234 (1961), *affirmed sub nom. Federal Power Commission* v. *Southern California Edison Company*, 376 U.S. 205 (1964), reversing 310 F. 2d 784 (CA9). FPL's reliance on staff's use of the steady state method in *Colton*, however, is misplaced. As the Commission pointed out in its opinion in that case, the result reached by staff's technique would have been the same had staff there treated the bus as a point under the commingling concept.

of a three-phase electric power system as satisfactorily as does staff's concept. Certainly, FPL's method is of no value in demonstrating a negative, namely, that energy will not flow through a bus to a certain specific transmission line. Yet, FPL's reliance on this method in this proceeding seeks to prove just such a negative.

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The examiner correctly found that staff's commingled method reflected the physical reality of the bus better than did FPL's steady state or systems studies method. The essential soundness of the commingled method has long been recognized and approved. See *Pennsylvania Water & Power Co.* v. *Federal Power Commission*, 343 U.S. 414 (1952); *Wisconsin-Michigan Power Co.* v. *Federal Power Commission*, 197 F. 2d 472 (CA 7, 1952), *cert. denied*, 345 U.S. 934 (1953). Our adoption of the examiner's holding on this point certainly is consistent with our repeated approval of the commingled method in recent jurisdictional proceedings where we have found a need for precise methods in analyzing power flows on highly complex systems involving a multiplicity of interconnections. See our opinions in *Indiana & Michigan* and *Arkansas*, cited at page 6, *supra*.[5]

Consideration has been given to FPL's assertion that because of the unique peninsular nature of its service area it planned its system to be self-sufficient, and that it possesses sufficient generating capacity of its own to meet its loads without any dependence upon the spinning reserves or emergency power of other Florida or out-of-state systems. We do not find this assertion persuasive. The fact that FPL could operate as a self-sufficient utility is not con-

[5] In view of the above showing of substantial flows of interstate energy to and from FPL's system, it is clear that FPL owns facilities which do not come within the purview of the exemptions to the Commission's jurisdiction set forth in Section 201(b) of the Act.

trolling because FPL simply does not operate its system in that manner. The record in this proceeding makes it plain that FPL receives substantial benefits from its participation in the Florida Pool in the coordination of spinning reserves, the arrangement of plant maintenance schedules, and the assurance of reliability of frequency control and from both the Florida Pool and ISG in the form of automatic assistance in the case of emergencies. As we stated in our opinion in *Indiana & Michigan Electric Company, supra*, it is the system's actual mode of operation, not how the system could operate that is important. Moreover, the particular operating pattern actually used by FPL is consistent with sound operating practices and with the principles enunciated in the Commission's National Power Survey issued in December 1964 in which all segments of the electric power industry participated fully and cooperatively.

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We have also considered FPL's contention that it receives virtually no benefits from its membership in ISG with respect to emergency assistance because of its assertion that the Florida peninsula would be electrically isolated from the states to the north in the event of an outage of approximately 100 mw or greater. This contention minimizes the fact that ISG aid to FPL is available as emergency assistance in the case of any outage of less than 100 mw. As we pointed out above, 12 of FPL's 24 generating units generate 75 mw or less. The emergency outage of any one of these units would automatically bring ISG aid to FPL in the event that FPL's own reserves and the reserves of the other members of the Florida Pool were not instantaneously available. It appears that this is at least one of the contingencies which an emergency assistance agreement contemplates.

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FPL urges that the Commission should decline to exercise jurisdiction in this proceeding, stating that any transmission of interstate energy which may have been accomplished is *de minimis*, and that the exercise of Commission jurisdiction would subject FPL to most burdensome additional costs without serving the public interest.

Assuming *arguendo*, that we have discretion, this is not a case where the Commission should decline to exercise its jurisdiction. The Commission has already determined that jurisdiction does not depend upon a finding of any particular volume or proportion of interstate energy flowing in a system and this position has been upheld in the courts. *Connecticut Light and Power Company* v. *Federal Power Commission*, 324 U.S. 515, 535-536 (1945); *Jersey Central Power & Light Co.* v. *Federal Power Commission*, 319 U.S. 61 (1942); *Public Service Company of Indiana* v. *Federal Power Commission*, — F. 2d — (CA7, January 13, 1967). Similarly, we do not believe that, where there

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are other benefits accruing to a company under the interconnected operating arrangements, the amount of energy flowing interstate should be decisive on the question of whether we ought to decline to exercise jurisdiction. Here the role played by FPL in the Florida Pool, in aiding Corp to interchange energy with Georgia and the other subsidiaries of Southern, and in the ISG is of greater significance than the actual volume of energy exchanged by it would ordinarily indicate. And this volume of energy, although constituting but a small percentage of FPL's

total generating capacity,[6] is nevertheless not insubstantial.

In considering FPL's request that we decline jurisdiction here, the Commission cannot ignore the fact that information recently filed by FPL in its FPC Form No. 12 for 1965 shows that FPL's interchange of energy with other members of the Florida Pool was 300 percent greater in number of kilowatt hours in 1965 than in 1964. Nor can we ignore the record showing that the members of the Florida Pool, in considering their generating and transmission needs for 1970, have studied plans which contemplates stronger interconnections with the utilities in the Southern Company, to the extent of anticipating the capability of transfer of as much as 350,000 kw to 400,000 kw with Southern. FPL's role in these future plans for growth and interconnection obviously is a vital and significant one. As the largest electric utility in the State of Florida, and as one of the major electric utilities in the United States, FPL's importance in insuring the increased reliability of interconnected power systems in Florida and in adjoining states is self-evident. We do not believe that the public interest will be served by any Commission ruling which would tend to inhibit FPL from a sound and efficient expansion of its participation in the Florida Pool and ISG interconnections.

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Yet FPL's request that we decline jurisdiction here because its past interstate transmission activities have allegedly

[6] We do not find satisfactory record support for FPL's claim that the interstate energy which flows into its system is no more than 1/7000 of one percent of the total energy delivered to FPL's customers. FPL apparently arrived at this figure by assuming that the power flowing across the state line from Georgia could be traced to the Sanford-Turner interconnection between Corp and FPL. In so doing FPL ignored the effect of commingling of energy from different sources, and also ignored the fact that Georgia power may flow into its system over three other high voltage tie-lines.

been small, could, if granted, very well inhibit it from participating in future interconnection programs, and could conceivably cause it to restrict its present interconnection arrangements to its own detriment and to the detriment of other Pool members. Plainly, the public interest will not be served by this result.

The suggestion by counsel for FPL during the oral argument that we should wait to consider assuming jurisdiction until there is an actual complaint by a wholesale customer, either existing or potential, misconceives the broad statutory design which Congress had in mind in enacting Parts II and III of the Federal Power Act. Congress sought not only to give this Commission exclusive jurisdiction over wholesale sales in interstate commerce, but, in addition, to supplement local regulations at the federal level in such areas as accounting, interlocking directorates, mergers and consolidations, and the promotion of interconnection and coordination of the nation's facilities for the generation, transmission and sale of electric energy. None of these latter objectives depend upon the extent of wholesale sales or the percentage of interstate transmission in any particular case. The independent importance of these regulatory activities was spelled out in detail by the Commission, in light of the Act's legislative history, almost 20 year ago in the *Connecticut Light and Power* case, *supra*. FPL has presented no argument which would now persuade us to a contrary conclusion.

We agree with the examiner that FPL will not be subjected to any unduly burdensome costs by our requirement that it keep its accounts in accordance with the Commissions's Uniform System of Accounts for Public Utilities. Although FPL asserts that it will incur more than $500,000 additional annual costs if it must comply with the Commission's accounting requirements, its contention is unsupported on the record before us. With respect to reporting,

FPL presently files this Commission's principal report forms, FPC Form No. 1, Annual Report, and FPC Form No. 12, Power System Statement, as required under Section 311, among other sections, of the Power Act. Nor should any substantial expense result from FPL's compliance with the Commission's accounting requirements. FPL presently keeps its plant accounts on an original cost

basis and maintains its books of account in accordance with the NARUC (National Association of Railroad and Utilities Commissioners) system of accounts which are similar to those of the Commission's Uniform System of Accounts.

FPL's further assertion that it will incur an estimated 4 to 6 million dollar expense to complete an initial plant inventory required by the Commission's Uniform System of Accounts is based upon indefinite and conjectural evidence, and plainly reveals a definite misunderstanding of what is required of it under the Commission's regulations. Thus, FPL's estimate of these costs erroneously includes the sum of approximately $3,200,000 for an aerial map survey of its system, when the Commission's requirements do not require such an aerial survey. Also, it appears that FPL's cost predictions are based upon costs incurred by other electric utilities in compiling their plant inventories for the Commission's regulatory purposes in prior years. The studies made by these other companies are not comparable because their plant accounts were not kept pursuant to a uniform system of accounts at that time. On the other hand, FPL has been keeping its plant accounts on an original cost basis at least since 1951, and was required to make a complete reclassification of its plant accounts on an original costs basis by the Securities & Exchange Commission as of January 1, 1942. FPL's witness at the hearing admitted that to his knowledge FPL had not con-

tacted any members of this Commission's accounting staff to obtain information concerning the requirements of complying with the Commission's Uniform System of Accounts, and also conceded a lack of knowledge as to whether or not FPL's reclassification studies accepted by the Securities & Exchange Commission in 1942 and the years thereafter would be accepted by the Commission. In this connection, it may be added that FPL apparently gave no weight to the fact that the Commission's auditing procedures are designed to avoid any unnecessary overlapping or duplication of state commission audits, and that joint federal and state audits are encouraged. In light of the foregoing circumstances, we find that the examiner correctly concluded that it would not be burdensome for FPL to conform to the Commission's accounting requirements.

To the extent that FPL seeks exemption from the Commission's accounting requirements because its transmission of energy is predominantly intrastate, we deem it appropriate to restate our language in *The Connecticut Light and Power Company*, 6 FPC 104, 108 (1947), as follows:

> The legislative history of the Act shows, furthermore, that it was anticipated in Congress that the federal accounting requirements would apply to utilities predominantly engaged in local business subject to State regulation. Thus, Representative Cole, explaining the bill in the House on behalf of the House Committee, said (79 Cong. Rec., Part 9, p. 10384):
>
> A uniform system of accounting is established, and because of the demand therefor and the admission on the part of most everyone that such is advisable, the provisions therefor will very likely be required of companies now subject to State regulation because of a small fraction of their business being under the Fed-

> eral Commission. We have thought this advisable because it is most necessary to have uniformity in accounting as well as depreciation instead of 48 different methods. This provision will be followed, in my judgment, by the adoption by the State Commission of such uniform method as the Federal Power Commission will prescribe.

Significantly, Congress rejected efforts to amend the Act to exempt utilities regulated by a state commission, and the legislative debates at that time showed that the proponents of the Act regarded it essential that the Commission possess the power to get accounting information under a unified accounting system, regardless of the fact that a reporting utility might also be subject to state regulation. In light of this background, we do not find that the public interest will be served by exempting FPL from compliance with the Commission's accounting requirements.

The Commission further finds:

(1) Florida Power & Light Company (FPL) is a corporation organized and existing pursuant to the laws of the State of Florida.

(2) FPL owns and operates facilities, among others, for the transmission of electric energy transmitted from points of generation in the States of Georgia and Florida to points of consumption outside the State in which it is

generated, which facilities are in addition to, and do not include, facilities used for the generation of electric energy, facilities used in local distribution or only for the transmission of electric energy in intrastate commerce, or facilities for the transmission of electric energy consumed wholly by the transmitter.

(3) FPL is, therefore, a public utility within the meaning of that term as used in Section 201 of the Federal Power Act and subject to the jurisdiction of the Commission.

(4) FPL, as a public utility under the Federal Power Act, should be ordered, *inter alia*, to file with the Federal Power Commission original cost statements in the manner provided in Section 120.3 of the Commission's Regulations under the Federal Power Act and Electric Plant Instruction No. 1 of the Commission's Uniform System of Accounts Prescribed for Public Utilities and Licensees Subject to the Provisions of the Federal Power Act.

(5) The exceptions of FPL and of the Florida Commission to the examiner's initial decision should be denied.

The Commission orders:

(A) Within 60 days after the issuance of this order, FPL shall file with the Federal Power Commission original cost statements in the manner provided in Section 120.3 of the Commission's Regulations under the Federal Power Act and Electric Plant Instruction No. 1 of the Commission's Uniform System of Accounts Prescribed for Public Utilities and Licensees Subject to the Provisions of the Federal Power Act, and shall comply with all requirements of the Commission's Regulations under such Act.

(B) The decision of the presiding examiner, as supplemented above, is adopted as the decision of the Commission.

(C) The exceptions to the examiner's decision are denied.

By the Commission. Commissioner Carver, joined by Commissioner O'Connor, dissenting, filed a separate statement appended hereto.

(SEAL)

/s/ J. H. GUTRIDE
Joseph H. Gutride,
Secretary.

CARVER, Commissioner, joined by O'CONNOR, Commissioner, dissenting:

By eschewing the opportunity to let this case turn on the exercise of a discretion in the Commission not to take jurisdiction, and electing to have it turn on the "commingling" test of jurisdiction, the Commission has made it necessary for me to dissent.

This dissent does not stem from sympathy for the Florida Power & Light Company, whose arguments against being regulated, particularly in the matter of the impact of conformance with the Uniform System of Accounts, affront the legislative purpose. Congress did not saddle consumers with "unnecessary" costs, when it directed the Commission to set up a uniform accounting system.

Nor is my dissent based upon a belief that the Commission has misread or misinterpreted the thrust of certain recent judicial pronouncements on the "commingling" theory. The cases cited are distinguishable on the facts, but the thrust is in the direction the Commission has taken.

The vice I find in the Commission's decision, which prevents me from joining in its statement, is that its adoption of the commingling theory as a test for jurisdiction *per se*, interprets the Federal Power Act to have a reach beyond that which I find in the statute.

The Federal Power Act is today found to grant to the Commission jurisdiction over *any* company which generates electric energy in the form of alternating three-phase 60-cycle current, if that company is interconnected and electromagnetically synchronized with any other generating source producing electric energy in the same form in another State.

More than 90% of the Nation's electric generating capacity is interconnected in this fashion. The only major

exception is the electric generation of Texas, which is interconnected within Texas but not with out-of-Texas systems. Such a test for jurisdiction writes out of the statute the intrastate and industrial exceptions to coverage under the Act, and in doing so objectionably usurps a prerogative of the Congress.

From its outset, the case was tried on the narrow issue of jurisdiction—a so-called "straight status case." Florida

Power & Light Company has an interconnection with Florida Power Corporation, at a point 180 miles from the Georgia state line. The decision turns on the theory that at this interconnection, any "flow" of energy from Florida Power Corporation to Florida Power and Light Company may not be assumed to be Florida-generated energy from Florida Power Corporation's generating system, but rather to be interstate in origin by reason of the interconnection by the Florida Power Corporation with out-of-Florida generating sources. The Florida Power Corporation system is said to be "permeated" or commingled with out-of-Florida energy.

The facts of interconnection are uncontroverted. Aided by the engineering testimony of Staff witnesses Jessel and Jacobsen, the Staff's case for the ultimate jurisdictional fact of electric energy in Florida Power & Light Company's system being transmitted in interstate commerce is this "permeation" or "commingling". The examiner neatly summarized:

> "The cause and effect relationship in electric energy occurring throughout every generator and point on the Georgia, Corp and Florida systems constitutes interstate transmission of electric energy by, to, and from Florida. It is the electromagnetic unity of response

> of Florida, Corp, Georgia and other interconnecting systems that constitutes the interstate transmission of electric energy by Florida." (Ex. Dec. Mimeo., p. 11)

In undertaking to temper the impact of the examiner's forthrightness (a forthrightness conforming to the theory upon which Staff's case was submitted), the Commission turns to Exhibit 18 as supporting a Commission finding (as opposed to an Examiner's finding) that interstate energy reached the system of Florida Power & Light Company. But that exhibit (or any exhibit) shows no more than that "commingled" energy reached the Florida Power & Light Company system. This assumes the fact in issue, and thus begs either the question of jurisdiction or the question of substantiality or both. No staff exhibit purports to depart from the assumptions made to support the "commingling" theory.

The examiner fairly recognized that "commingling" is only a theory. But he found that the theory of commingling was sound and proved, and that its proof obviated tracing.

If commingling obviates tracing, then the reach of the Commission's jurisdiction is plenary. Furthermore, it has

become plenary in 1967, while the act was passed in 1935 and has not been changed by Congress (in respects material here) since.

The Supreme Court in *Connecticut Light and Power Co.* v. *FPC*, 324 U. S. 515, at 515, credited the Congress with determining that

> "federal jurisdiction was to follow the flow of electric energy." (at 529)

But is federal jurisdiction to follow the changes in the theories which are devised by company or Commission engineers to describe a still-mysterious phenomenon? For myself, I cannot accept the premise that the "commingling" theory can change the law as radically as to eliminate two explicit exceptions to our jurisdiction.

Turning to the cases cited by the majority, most of these cases involved jurisdiction over wholesale sales, not jurisdiction *per se*. The two "straight status" cases in the Supreme Court reports—*Connecticut Light and Power Company* v. *FPC*, 324 U. S. 515 (1945), and *Jersey Central Power & Light Co.* v. *FPC*, 319 U. S. 61 (1942)—do not support the approach used here, and the Commission's opinion today is directly contrary to the latter's statement (at 319 U. S. 72) that "mere connection determines nothing." Today's decision has connection determine everything.

The cases cited in the Commission's opinion, although sales cases not solely status cases, carry the process of interpreting legislative language *almost* as far as the Commission goes today. The final step may be a short one, but short or not, it is legislative.

The discussion which asserts that the commingling or electromagnetic synchronism test for jurisdiction under section 201 of the Federal Power Act supports the public interest in the expansion and extension of interconnection arrangements for greater service reliability is not persuasive. I fully agree that interconnections serve the objective of reliability, and that reliability is strongly in the public interest. But with the present near universality of interconnections, it would seem that the Commission's opinion would as likely lead to present connections being broken as to new connections

being established or existing connections strengthened.

Congress may have intended that the provision of section 201(b) which states that the Commission "shall not have jurisdiction . . . over facilities used . . . only for the transmission of electric energy in intrastate commerce, or over facilities for the transmission of electric energy consumed wholly by the transmitter" was to have a diminishing effect with the passage of time; but I do not think that Congress can be said to have intended this diminution to proceed to the vanishing point. It reaches that point for all practical purposes when the Commission adopts the commingling test for determining interstate flows after virtually the entire electric generating capacity of the United States is interconnected under electromagnetically synchronous conditions.

My doubts that the statute should be so read are reinforced when the diminished meaning of section 202 following the application of the commingling test is considered.

The stated purpose of section 202 was to assure an abundant supply of economical energy by *voluntary* interconnection of facilities. If jurisdiction inexorably follows interconnection, the nonjurisdictional utilities cannot retain any aspect of their independence once they agree to interconnect. Impregnation is indivisible. Such a reading of section 202 is hardly conformable to its general spirit, and is inconsistent with the legislative history of this part of the Act.[1]

Another consideration, not related to the scope of the statute, suggests itself. The Commission's adoption of the

[1] Senate Report No. 621 on S. 2796, 74th Cong., 1st Sess., at p. 49, May 13, 1935; and, House Report No. 1318 on S. 2796, 74th Cong., 1st Sess., at p. 27, June 24, 1935.

commingling theory conceivably could deny to a small utility remote from its supplier's generation the opportunity to object to wheeling charges on a mileage or rolled-in cost basis, as opposed to cheaper charges based on a displacement theory. The far-reaching commingling theory adopted today could prove embarrassing to the Commission, which presumably would not want to have one rule for establishing jurisdiction, and another for regulating under it.

I do not wish to be misunderstood. From the standpoint of it being the largest electric utility in Florida, on the basis of its being nationally ninth in revenues, fourteenth in plant investment, and sixteenth in energy sales, and from the standpoint of the upward trend in its energy transactions with interconnected companies, Florida Power & Light Company probably ought to be under Federal Power Commission regulation.

But our adjudicative responsibilities do not turn upon what the law ought to be, but upon what it is. Counsel for the company candidly admitted that the law as it is quite possibly would apply to one of his company's wholesale sales. Such a result might be equally offensive to my reading of the statute, but it would have the merit of resting squarely upon decided cases. We elected to plow new ground with a straight jurisdictional approach, and absent square authority, I find the result to constitute too great a stretching of our charter. I would reverse the examiner, and let a jurisdictional finding wait for a sale case.

/s/ JOHN A. CARVER, JR.
John A. Carver, Jr.,
Commissioner

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UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

Docket No. E-7210

In the Matter of

Florida Power & Light Company

Application for Rehearing of Florida Power & Light Company

Florida Power & Light Company (Company or FPL), respondent in the above entitled proceeding, hereby petitions under Section 313(a) of the Federal Power Act and Section 1.34 of the Commission's Rules of Practice and Procedure for rehearing of the Commission's Opinion No. 517 and Order Determining Jurisdiction, issued March 20, 1967 (Opinion) and for such other relief as is hereinafter specified.

The grounds for this application are that there is no basis in law or in fact for the Federal Power Commission's finding that the Company: (a) owns or operates facilities for the transmission of electric energy in interstate commerce; (b) is a public utility within the meaning of Section 201 of the Federal Power Act; and (c) should be required to maintain its accounts in accordance with the Commission's Uniform System of Accounts for Public Utilities and Licensees and file original cost statements and comply

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with all other requirements of the Commission's Regulations. This application is based upon the following objections and contentions and each matter which follows constitutes an objection and contention to said Opinion and

Order and sets forth the manner in which the Commission erred.

Before considering specific objections, however, it should be pointed out that the Company's size in terms of revenue, investment, sales or number of customers served (Opinion, p. 3) is totally irrelevant to the question of whether it is a "public utility" within the meaning of Section 201 of the Act. While the Company does indeed serve a large number of customers, only seven, of a total of approximately a million customers, are not local distribution customers (who under no circumstances are subject to FPC jurisdiction), and almost 100% (98.95%) of the Company's revenues are derived from sales to such local distribution customers.

(1) The Commission Erred in Finding that the Company is a Party to a Pooling Arrangement and Thus Transmits Electric Energy in Interstate Commerce.

At pages 3-5 of the Opinion the Commission finds that the Company is a member of the Florida Operating Committee which it calls the "Florida Pool" (p. 3). The Commission supports this finding on the basis that the

Company is directly interconnected with four other Florida electric systems and that one of these, Florida Power Corporation, is directly interconnected with Georgia Power Company and Gulf Power Company which in turn are connected either directly or indirectly with numerous utilities in other states.

The Commission is in error on this finding because the mere fact of an emergency interconnection of the type which the Company has with the other Florida utilities is insufficient to constitute membership in a "pool." This is borne out when the characteristics of the Company's operations are examined in detail.

The Company is not a party to any multiparty or pooling agreements (T. 229). It has no firm power contracts to buy from or sell to, either directly or indirectly, any company in or outside the State of Florida (T. 228). Further, the Company does not buy or receive power from, or sell or deliver power to, any electric system in another state (T. 229, 240). All prearranged power transactions between the Company and the electric systems with which it is inter-connected are under emergency conditions on a "when, as and if basis." The Company does not buy or sell economy energy because the cost of fuel and transmission losses are so

nearly the same that there is no opportunity for exchanging economy energy (see Examiner's Decision, p. 3).

Further, the semantic label "pool" is meaningless. The Commission has specifically set forth its basic test in its Opinion No. 485, in *Cincinnati Gas & Electric Co.*, that:

> "Though there are necessarily factual differences among the cases, the *rationale underlying the decisions is evident*—where a utility which is part of an electrically *integrated interstate power network* makes sales for resale from the network, Commission jurisdiction attaches." (Emphasis added.)

Accordingly, even if FPL were a member of a so-called Florida Pool, it could in no way be said to be part of an "integrated interstate power network," and the Commission did not make (nor could it have made) any such finding.

(2) The Commission Erred in Finding that by Mere Membership in ISG, FPL Transmits Electric Energy in Interstate Commerce.

At page 4 in discussing the Interconnected Systems Group (ISG),* the Opinion attempts to link the Company's

system with electric systems outside the State of Florida. But again, there is no finding that any electric energy generated out of the State of Florida is in fact received by the Company or that any electric energy generated by the Company in fact goes out of the State of Florida. The Opinion erred specifically (pp. 4, 5 and 9) in finding that:

(a) During a 580 mw generator loss by a midwestern utility, the Company contributed 8 mw to ISG because the record is crystal clear that any contribution in the form of increased generation by the Company "would be absorbed by neighboring systems in Florida and would never reach the state line some 180 miles away" (T. 245). Therefore, any effect on the Company's generation caused by a loss of generation in another state would not result in the Company's transmitting electric energy in interstate commerce.

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* As the Commission is aware, the Integrated Systems Group is a purely voluntary, non-operating body, without formal organization, composed of representatives of member companies and exists principally "to discuss, formulate and recommend the necessary and desirable principles and procedures affecting interconnected operation." It has no administrative or operating authority, or even contractual relationships with the members, and, of course, exercises no dispatching functions. In substance, it is much closer in nature to a committee of a trade association than it is to a "power pool." It therefore bears no resemblance to the systems involved in the *Indiana & Michigan*, *Arkansas*, *Public Service of Indiana* and *Cincinnati* cases recently decided by the Commission. Consequently, as the First Circuit decided on March 31, 1967, in *New England Electric System* v. *FPC*, — F.2d — (Case No. 6332, Slip Opinion, p. 13): "Comparison with * * * the situations of other companies in other places at other times cannot be conclusive."

(b) The Company can give assistance to, or receive assistance from ISG members with which it is not directly connected. On the contrary, the Company can only give assistance to immediately adjoining electric systems, all of which are wholly within the State of Florida.

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(3) The Commission Erred in Accepting the Examiner's Finding that the Company's Operation in Electromagnetic Unity with Other Utilities is Evidence that its Facilities Contain Interstate Energy.

(a) Such Finding is not Supported by any Substantial Evidence.

The Commission has accepted the Examiner's conclusion that merely being indirectly interconnected with an electric system in another state automatically causes a company to be engaged in the interstate transmission of electric energy. This conclusion is contrary to the provisions of the Federal Power Act and their interpretation in the courts.

It is clear from Section 201 of the Act that the Company cannot be held to be a "public utility" under the Act unless there is substantial evidence to support a finding that it actually transmits electric energy in interstate commerce, i.e., electric energy "transmitted from a State and consumed at any price outside thereof." And the Supreme Court has repeatedly said in identical language:

> "Federal jurisdiction was to follow the flow of electric energy an engineering and scientific, rather than a legalistic or governmental, test."*

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* See *Connecticut Light & Power Co.* v. *FPC*, 324 U.S. at 529 (1945) and *FPC* v. *Southern California Edison Co.*, 376 U.S. at 209, n. 5 (1964).

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As the dissenting opinion (p. 3) points out, the Supreme Court has also made clear that mere connection of a company's facilities with those of others does not automatically result in transmission of electric energy in interstate commerce.

> ". . . Commission power does not extend over all connecting transmitting facilities but only over those which transmit *energy actually moving in interstate commerce. Mere connection determines nothing.*" (Emphasis added.) *Jersey Central Power & Light Company* v. *FPC*, 319 U.S. 61, 72 (1943).

Jurisdiction is dependent on the flow of electric energy from one state to another. The test is *not the "effect on* interstate commerce"* commonly found in broad jurisdictional statutes. The transmission *must be "in* interstate commerce", and the test is whether the electric energy transmitted by the Company crosses a state line.

But the Examiner has confused an electrical phenomenon called electromagnetic response with interstate transmission of electric energy. Although electric companies have operated in synchronism or parallel for many years, it does not follow that flows of power between interconnected systems are interstate in nature (T. 245), nor that ingenious theories of Commission engineers, as the dissent makes clear (p. 3), can rewrite the Federal Power Act.

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(b) The Staff's Showing Here is not Consistent with the Recent Decisions of the Commission Involving

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* *79 Cong. Rec. 10384.* And even in cases where the effect on interstate commerce is the test, such effect must be both "economic" and "substantial," *Wickard* v. *Fillburn*, 317 U.S. 111, 125 (1942).

Wholesale Sales, and the "Methodology" of those Cases has no Relevance to this Proceeding.

The four decisions of the Commission referred to at page 6 of the Opinion (*I&M, Arkansas, Public Service Co. of Indiana,* and *Cincinnati*) in fact illuminate the vast differences that exist between the operations of the Company and those involved in the Commission's recent jurisdictional cases involving wholesale sales.* In each of these decisions the Commission found that the particular company was part of an integrated, interstate electrical system receiving large quantities of energy from outside the state involved. In three of the cases there was also a finding of pooling of energy across state lines, coupled with affiliated group control and central interchange of energy involving more states than one. *In every case the existence of out-of-state energy in the respondent Company's system was acknowledged by all parties.* No court has yet held that the mere fact of operation in electromagnetic unity, alone, confers jurisdiction on the Commission over anything.

In consequence, the assertion of jurisdiction over the Company would entail a major departure from all past precedents of both the courts and the Commission itself, without logical, or substantive, justification. It is respectfully submitted that the staff failed entirely in carrying the burden of proof imposed upon it by the very nature of

* In this connection it should be pointed out that the dissent incorrectly states (p. 5) that counsel for the Company admitted that the law as it is quite possibly would apply to one of the Company's wholesale sales. At the oral argument counsel for the Company said that "one thing I wanted to make clear is I hadn't conceded * * * that interstate energy * * * does flow into the Florida Power and Light system." (T. 889) And without any interstate energy in the system there could, of course, be no FPC jurisdiction over any aspect of the Company's business or operations.

this proceeding and that the Commission erred in accepting the Examiner's reliance on the undocumented and patently erroneous theories of the staff as the sole support for his mistaken decision.

As the dissent very well points out (p. 1), such a theoretical basis for jurisdiction:

> "writes out of the statute the intrastate and industrial exceptions to coverage under the Act, and in doing so objectionably usurps a prerogative of the Congress."

By the mere elevation of its hand, a Government bureau has decreed that henceforth transmission of electric energy in intrastate commerce no longer exists—a not inconsiderable feat in itself.

(4) The Commission Erred in Adopting the "Commingled Method" Rather than the "System Studies" Method of Tracing Energy Flows.

The basic difference between the Staff's tracing method and that of the Company lies in the treatment of what happens in a bus. If a bus is treated as having

electrical and physical dimensions, which, in reality, it does, the evidence in this case shows that *no* interstate energy was delivered to or by the Company's system, as was discussed in detail in our Exceptions to the Examiner's Decision.

The Commission correctly noted that the method employed by the Company was used by its own staff in *Colton* (Opinion, p. 7). It was Southern California Edison Company that argued in the *Colton* case that a bus should be treated as a point—and that because of this, and the fact that meter readings were not available on all lines con-

nected to the bus, there was no way to prove that interstate energy was sold to the City of Colton. The Commission in *Colton* relied solely on the steady state method used by its staff, from which it now seeks to depart because it does not produce the answer desired.

It is also clear that the Supreme Court in *Colton* upheld the Commission's findings based on the steady state method (376 U.S. at 209, n. 5). And rightfully so, since the Court in the *Jersey Central* case, rejected the treatment of a bus as a point and stated emphatically that:

> "Since the bus bar into which the Jersey Central energy is fed also receives large amounts of energy from other sources, the facts heretofore detailed do not prove conclusively that energy generated by Jersey Central passes to and is consumed in New York." (319 U.S. at 65).

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The Commission also erroneously states that the essential soundness of the "commingled method" has long been recognized and approved, citing the *Penn Water* and *Wisconsin-Michigan* cases (Opinion, p. 8). It is true that "commingling" of energy has been recognized by the Commission and the courts in prior cases. For even in the steady state and system studies methods commingling takes place in a bus when energy from different sources meets. And the Company has never argued to the contrary. But "commingling" does not require, or justify, the treatment of a bus as a point as the staff did in its "commingled method" in the instant case.

It is therefore evident that only by tracing power flows through the bus, such as is done in the system studies method and the steady-state method used by the Staff in *Colton* and all prior cases, can the necessary proof be fur-

nished. In a strained effort to find that interstate energy reaches the Company's system, the Commission has rejected the very method that it has used for over 20 years with judicial approval.

(5) The Commission Erred in Finding that the Company Does not, in fact, Operate as a Self-sufficient Utility.

The Commission bases such finding on the grounds (Opinion, p. 8) that the Company "receives substantial

benefits from its participation in the Florida Pool in the coordination of spinning reserves, the arrangement of plant maintenance schedules, and the assurance of reliability of frequency control and from both the Florida Pool and ISG in the form of automatic assistance in the case of emergencies."*

There is absolutely no evidence in the record to support the finding that each ISG member renders automatic assistance to the other in times of emergency. But the evidence does show that when there is a loss of generation or load of 100 mw or greater in the Florida peninsula south of Ft. White, the resulting increase in power flows in Florida Power Corporation's system causes its system to open up, or split, at Ft. White, thus separating the Florida peninsula from Georgia (T. 236-7). This means that the Florida peninsula south of Ft. White is electrically isolated from *all* systems north of that point, including Georgia Power and Gulf Power.

* The Commission also erroneously states that FPL aided Florida Power Corporation in interchanging energy with Georgia Power Company and other out-of-state systems (Opinion, p. 10). There is no evidence to support such a finding. Similarly, the Commission's discussion (Opinion, p. 10) of FPL's interchange of energy with other systems in Florida and generation and transmission studies for possible interconnection *in the future* is totally irrelevant to a determination, now, of whether FPL transmits electric energy in interstate commerce.

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The loss of any one of 12 of the Company's generating units, representing 83% of its total generating capability or the loss of any one of ten generating units owned by other Florida electric systems, would result in a split at Ft. White (T. 239). And, during the first seven months of 1965, there were eight such splits (T. 238, 751-3). Because of this internal splitting, and resulting isolation, of the systems in the Florida peninsula and the frequency of hurricanes in the Company's service area, the Company cannot, and does not, depend on any out-of-state systems in times of emergency (T. 238, 243). Therefore, the Florida electric systems operating south of Ft. White maintain their *own* spinning reserve at least equal to the largest unit then running (T. 242).

Since it cannot depend on any out-of-state help if it loses generation in excess of 100 mw, the Company has designed and operated its system to take care of its customers during such an outage. And it necessarily follows that if the Company can serve its loads with a loss in generation of this magnitude without out-of-state help, it needs and receives no help from out-of-state if it loses less than 100mw of generation.

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(6) The Commission Erred in Failing to Find, Regardless of any Engineering or Scientific Tests, that on the Facts of this Case no Transmission of Electric Energy in Interstate Commerce can Exist.

One of the most extraordinary things about the Commission's opinion is its complete failure to address itself to any of the basic legal issues raised by the Company. In its Brief on Exceptions, and in oral argument, FPL emphasized the fact that it is impossible to find on the

basis of this record, or otherwise, that the Company's facilities are used to perform any act in interstate commerce.

"Commerce," since the very beginnings of the Republic, has been defined as "intercourse for the purpose of trade." This definition has been precisely adhered to in subsequent generations, including such landmark cases as *Gibbons* v. *Ogden*, 9 Wheat 1, 189 (1824); *Adair* v. *U. S.*, 208 U. S. 161, 177 (1908); *Carter* v. *Carter Coal Co.*, 298 U. S. 238, 298 (1936); *United States* v. *South-Eastern Underwriters Assn.*, 322 U. S. 533, 539 (1944); *Heart of Atlanta Motel* v. *U. S.*, 379 U. S. 241, 253-255 (1964). In all of these cases the concept of interstate commerce involved *intentional, directed* activity.

Again, in all the cases decided by the courts upholding this Commissioner's jurisdiction under the Act, there has been involved intentional, directed activity in

transmitting electric energy for the purpose of supplying the needs of the electric utility involved—that of serving its customers. See *Connecticut Light & Power Co.* v. *FPC*, 324 U. S. 515 (1945); *Hartford Electric Light Co.* v. *FPC*, 131 F. 2d 953 (2d Cir. 1942); *FPC* v. *Arizona Edison Co.*, 194 F. 2d 679 (9th Cir. 1952); *Indiana & Michigan Electric Co.* v. *FPC*, 365 F. 2d 180 (7th Cir. 1966); *Arkansas Power & Light Co.* v. *FPC*, 368 F. 2d 376 (8th Cir. 1966); and *Public Service Company of Indiana* v. *FPC*, —— F. 2d —— (7th Cir. 1967).

Here none of these characteristics is present, not even to the extent of the passage of electric energy between the Company and its neighbors to insure dependability of service. The existence of the Turner interconnection between the Company and Florida Power Corporation is purely fortuitous, having been ordered by this Commission (2 FPC 991) as a wartime emergency measure.

In short, all that can be said is that, under the most hypothetical and incorrect assumptions, there may be an accidental and fortuitous passage of minuscule amounts of energy into the Florida Power & Light system, arising solely from mechanical fact of interconnection with the system of Florida Power Corporation. But such passage is not planned or intentional and clearly cannot be "intercourse for the

purposes of trade." Thus it cannot constitute the transmission of electric energy in interstate commerce.

In substance, as has been previously pointed out, the situation here does not differ from that envisioned by the Court in *Jersey Central Power & Light Company* v. *FPC*, 319 U.S. 61, 72 *supra,* in holding that the Commission's jurisdiction extends only over those facilities which transmit energy actually moving in interstate commerce. "Mere connection determines nothing."

(7) The Commission Erred in Completely Ignoring the Clear Intent of Congress that Isolated Companies such as FPL Were Never Intended to be Subject to the Act.

Equally as strange as the Commission's bland disregard of the Company's documented arguments as to the nonexistence of interstate commerce, is its failure to even mention the legislative history of the Federal Power Act and the landmark decision of the Supreme Court which is responsible for the major portion of the Commission's business today, *Public Utilities Commission of Rhode Island* v. *Attleboro Steam & Electric Co.*, 273 U.S. 83 (1927).

As was pointed out in detail in the Brief on Exceptions, the entire legislative history makes clear that the sole purpose of Congress in enacting Part II of the Federal Power Act was to supplement, and assist, state regulation,

and to fill the gap where state agencies could not effectively regulate electric utilities having multi-state contacts.

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This basic concern is demonstrated by both the testimony before Congress and the reports of the committees considering the bills which became Part II of the Federal Power Act. (See Brief on Exceptions, pp. 37-39).

By ignoring *Attleboro,* the Commission, of course, conveniently brushes aside more than 50 years of constitutional history and the very reason for its own being as the regulator of interstate electric public utility companies (as distinguished from its limited licensing jurisdiction under Part I). Such convenient silence permits non-reference to the basic test enunciated there by the Supreme Court (273 U. S. at 90):

> "the test * * * is not the character of the general business of the company, but whether the particular business which is regulated is essentially local or national in character,"

Thus the rationale of *Attleboro* was not that every interstate wholesale sale was, of necessity, beyond the constitutional power of the States to regulate, but rather that only interests of more than one state was there any essentially interests of more than one state was there an essentially national interest involved so that it would be a direct burden upon interstate commerce to permit state regulation. But even in *Attleboro* there was a dissent by Justice Brandeis, who found the matter to be essentially local in character, since less than 3% of the supplier's business was interstate, and that the order complained of was valid as an exercise of the police power which did not place an undue burden on interstate commerce.

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As the record demonstrates, it would be difficult to conceive of a more local utility enterprise than Florida Power & Light Company, where under even the most hypothetical and incorrect assumptions, no more than 1/7000 of 1% of the Company's total energy could be said to have interstate origins. But, unlike the *Attleboro* company, FPL has no interstate business of any sort.

(8) The Commission Erred in Departing from a Continuous Policy of More than 30 Years of not Exercising Jurisdiction Over Entirely Local, Intrastate Companies Like FPL.

Since 1935, to our knowledge, no action has ever been taken by this Commission against any electric company situated in a peripheral area of the country, having all of its facilities within a single state and no direct connection with any utility enterprise in another jurisdiction, until the initiation of this proceeding in February 1965, nearly 30 years after Part II of the Act went into effect. Indeed, in 1954, the staff's position was clear to the effect that jurisdiction over Florida Power & Light under the Act would not arise from the "very minor amounts of energy" that "might conceivably be traceable interstate" at an interconnection between the Company's lines and those of a neighboring Florida utility (Letter of Commission Secretary to the Company, February 24, 1954, Item M, by reference), which connection no longer exists.

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The Company contends that nothing new to establish jurisdiction has developed in this proceeding, or elsewhere. There is, in short, no substantial evidence in the record upon which a finding could be made to satisfy the required

statutory standard for the exercise of jurisdiction under Section 201 of the Act.

The Supreme Court has for many years been aware of the significance of long continued patterns of agency interpretation of their organic statutes, particularly with respect to significant aspects of administrative jurisdiction. In *Federal Trade Commission* v. *Bunte Brothers, Inc.*, 312 U.S. 349 (1941) where for 25 years the Federal Trade Commission had not construed the Federal Trade Commission Act as giving jurisdiction over certain intrastate transactions, Mr. Justice Frankfurter said:

> "But just as established practice may shed light on the extent of power conveyed by general statutory language, so *the want of assertion of power by those who presumably would be alert to exercise it, is equally significant in determining whether such power was actually conferred.*" (312 U.S. at p. 352) (Emphasis added.)

(9) The Commission Erred in not Declining Jurisdiction Where, Even Under the Most Hypothetical and Incorrect Assumptions, the Amount of Interstate Energy Which Could Find its Way into the Company's System Would be De Minimis.

Although the Supreme Court has held that Congress has not "conditioned the jurisdiction of the Commission upon

any particular volume or proportion of interstate energy involved," the Court has made it very clear that where out-of-state energy is *de minimis* in amount "Congress appears to have left to the Commission's sound administrative discretion to determine whether or not to assert its authority in such situations." *

* *Connecticut Light & Power Co.* v. *FPC*, 324 U.S. 515, 536 (1945).

Here, the record shows that using the most hypothetical and incorrect assumptions, with which the Company's witness disagrees (T. 267), so as to provide the maximum possible hypothetical delivery of interstate energy and its relation to the total energy received at Sanford by the Company from Florida Power Corporation's Turner plant, 16.5 mwh was the most that could have been received from Georgia. This 16.5 mwh amounts to 0.00015% (1/7000 of 1%)** of the Company's total energy delivered to its customers in the State of Florida. Conversely, the record is silent as to any quantity of electrical energy passing from the Company's system, through that of Florida Power Corporation, into Georgia or any other state.

Further, all energy coming into the State is subject to regulation by this Commission, and in fact is so regulated, Georgia Power Company having its rate schedule for sales to Florida Power Corporation on file with the Commission (Item J, by reference). By such antecedent Federal regulation, the state of consumption is not faced with locked-in costs which otherwise it might be powerless to control. Beyond this point all Federal or national interest ceases as the local agencies have full constitutional power to protect the local consumers. Similarly, the interests of investors and the public generally are completely protected by local jurisdiction over security issues and depreciation and accounting practices, the keeping of books on an original cost basis, and similar matters.

If 1/7000th of 1% is not *de minimis,* obviously no other situation can be. It is therefore respectfully submitted

** In footnote 6 at page 10 of its opinion, the Commission states that it did not find satisfactory record support for this figure. The Commission's attention is directed to T. 267-68, where Company witness Bivans explained, step by step, precisely how (including the commingling of interstate and intrastate energy) he arrived at the figure of .00015% or 1/7000th of 1%.

that the Commission's assertion of jurisdiction here not only rewrites Part II of the Federal Power Act, but as well renders the opinions of the Supreme Court in *Connecticut Light & Power* and *Colton* (that the Commission does have discretion to abstain from taking jurisdiction in *de minimis* situations) devoid of meaning. In sum, in the words of the First Circuit, in its opinion of March 31, 1967 in *New England Electric System* v. *SEC*, F. 2d (Case No. 6332, Slip Opinion, p. 6):

> "the Commission's opinion does not reveal that application of both reason and experience to facts which merits endorsement as the responsible exercise of expertise."

The statement in the Opinion at page 10 to the effect that if the Commission declines jurisdiction it will inhibit future desirable interconnections between the Company and other utilities is without foundation. Because of the isolated geographical position of the Company's system and the necessity, because of hurricanes, for avoiding dependence on other systems, it is highly unlikely that from a strictly operating standpoint the Company will interchange more than *de minimis* amounts of even *intra*-state energy for the forseeable future. And, as the dissent points out (p. 3):

> "the Commission's opinion would as likely lead to present connections being broken as to new connections being established or existing connections strengthened."

(10) The Commission Erred in Finding that the Company Will Not be Subjected to Burdensome Additional Costs if it Assumes Jurisdiction.

The Company's evidence shows (and there is no contradictory evidence in the record) that if the Commission

assumes jurisdiction, the initial cost of compliance to the Company would be in the magnitude of four to six million dollars (T. 215), in addition to continuing annual costs of more than $500,000 (T. 214-216), which, of necessity, would have to be borne by the Company's customers.

The Company made internal studies of its own and procured data as to the cost experience of other companies

in making detailed property evaluations and property records and in setting up the detailed accounting procedures required by the Commission's regulations, resulting in the millions of dollars of additional cost referred to above.

The Company's witness testified that the Commission's current auditing procedures would duplicate and overlap similar examinations and audits by the Florida Public Service Commission. As the testimony points out, these audits would require the presence of a number of Commission staff members in the Company's offices for many months, thereby tying up a large number of the Company's personnel. Not only would the Company be subject to the expense of its personnel being tied up in the course of the initial audit but, as there is no indication as to how often such audits would be made in the future, substantial additional expense to the Company would continue over an indefinite and unascertainable period of time (T. 215-216).

In substance, the Commission has committed the same error for which the Securities and Exchange Commission has just been reversed, by the First Circuit in *New England Electric System* v. *SEC, supra,* where the court pointed out (Slip Opinion, p. 8):

> "we do think that even taken together these items constitute at most a basis for reducing the estimated

figure by some amount, not for concluding that no increased costs have been proved."

Further, the Commission's opinion is somewhat disingenious (at p. 12-13) in implying that its major interest in asserting jurisdiction over Florida Power & Light Company is "to get accounting information under a unified accounting system." It requires little imagination to foresee that compliance with all the other provisions of the Act will be required very quickly once the Commission's accounting jurisdiction is established.

Conclusion

Wherefore, for the foregoing reasons, Florida Power & Light Company requests that this application for rehearing be granted in all respects, that upon such rehearing the Commission's Opinion and Order No. 517 be vacated, and that a new order issue dismissing this proceeding on the merits.

Respectfully submitted,

Florida Power & Light Company

By /s/ Harry A. Poth, Jr.
Harry A. Poth, Jr.
Its Attorney

Reid & Priest
815 Connecticut Ave., N. W.
Washington, D. C. 20006

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UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

Before Commissioners: Lee C. White, Chairman; L. J. O'Connor, Jr., Charles R. Ross, Carl E. Bagge, and John A. Carver, Jr.

FLORIDA POWER & LIGHT COMPANY Docket No. E-7210

Order Denying Application for Rehearing

(Issued May 2, 1967)

On March 20, 1967, the Commission issued Opinion No. 517 and accompanying Order in the above-entitled proceeding. Application for rehearing of this Opinion and Order has been timely filed under Section 313(a) of the Federal Power Act by the Florida Power & Light Company.

In Opinion No. 517 and Order the Commission found that the Florida Power & Light Company (FPL) is a public utility within the meaning of that term as used in Section 201 of the Federal Power Act and subject to the jurisdiction of the Commission because FPL owns and operates facilities, among others, for the transmission of electric energy transmitted from points of generation in the States of Georgia and Florida to points of consumption outside the State in which it is generated. The Commission further found that these facilities are in addition to, and do not include, facilities used by FPL for the generation of electric energy, facilities used in local distribution or only for the transmission of electric energy in intrastate commerce, or facilities for the transmission of electric energy consumed wholly by the transmitter. The Commission ordered FPL to file original cost statements in the manner provided in Section 120.3 of the Commission's Regulations under the Federal Power Act and Electric Plant Instruction No. 1 of the Commission's Uniform Sys-

tem of Accounts Prescribed for Public Utilities and Licensees Subject to the Provisions of the Federal Power Act. FPL was also ordered to comply with all requirements of the Commission's Regulations under such Act.

FPL requests that the Commission grant rehearing and thereafter issue a new order dismissing this proceeding on the merits, asserting that the Commission's findings as above described are without basis in law or in fact. In support of its application for rehearing, FPL lists numerous specific findings which it contends represent error on the part of the Commission.

Upon consideration of FPL's application the Commission finds that the arguments advanced by FPL are essentially the same as those set forth in its brief to the examiner and in its exceptions to the examiner's initial decision. These arguments were covered in the examiner's decision and were rejected in the Commission's Opinion No. 517. No new facts or arguments are presented which would be cause for granting rehearing or disturbing the original Opinion and Order.

The Commission finds:

The assignments of error and grounds for rehearing set forth in the above-described application for rehearing present no facts or principles of law which were not considered by the Commission when it issued its Opinion No. 517 and accompanying Order on March 20, 1967, and which having now been considered warrant any change in or modification of said Opinion and Order.

The Commission orders:

The application for rehearing filed by the applicant, Florida Power & Light Company, on April 11, 1967, is hereby denied.

By the Commission. Commissioners Carver and O'Connor dissenting for the reasons set forth in their dissent to Opinion No. 517 issued March 20, 1967.

(SEAL)

JOSEPH H. GUTRIDE,
Secretary.

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UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

Before Commissioners: Lee C. White, Chairman; L. J. O'Connor, Jr., Charles R. Ross, Carl E. Bagge, and John A. Carver, Jr.

FLORIDA POWER & LIGHT COMPANY Docket No. E-7210

Order Providing for Extension of Time

(Issued May 2, 1967)

Upon consideration of the subject matters set forth in a motion filed on April 4, 1967 by Florida Power & Light Company (FP&L) requesting a stay of the effectiveness of ordering paragraph (A) of the Commission's order accompanying Opinion No. 517, we deem it appropriate to extend the time for compliance in the manner hereinafter presented.

The time for compliance with this Commission's accounting requirements is a matter of Commission discretion. Upon the facts of this case we deem it appropriate to extend the time within which FP&L must comply with ordering paragraph (A) to a date to be fixed by further Commission order.

The Commission finds:

Good cause has been shown for extending the time for FP&L's compliance with ordering paragraph (A) of the Commission's order accompanying Opinion No. 517 until

further order of this Commission, but in any event no later than 60 days after final judicial review under Section 313 of the Federal Power Act of the Commission's Opinion and Order issued March 20, 1967, or expiration of the time within which to petition for such review.

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The Commission orders:

The time for compliance with ordering paragraph (A) of the Commission's order accompanying Opinion No. 517 is hereby extended in the manner set forth in the finding above.

By the Commission.

(SEAL)

JOSEPH H. GUTRIDE,
Secretary.

* * * * *

Q. Mr. JACOBSEN. Do you wish to comment upon Mr. Bivans' testimony beginning on page 21 concerning "power pool" as related to the electric utility systems comprising the Florida Operating Committee?

A. Yes. It is apparent that FPL recognizes that the companies comprising the Florida Operating Committee constitute a "pool" since it has a column on its Form 770 Rev. 4/63 "System Dispatchers Interchange Log" with the heading *Pool Inadvert*, which is shown on my Exhibit No. 26.

Q. Mr. JACOBSEN. *Inadvert* is the abbreviated form of what word?

A. Inadvertent. The column heading properly should read, space allowing of course, "Pool Inadvertent Interchange".

Q. What is the definition of inadvertent interchange?

A. The definition of inadvertent interchange as stated in "Definitions of Terminology for Automatic Generation Control on Electric Power Systems" (AIEE pamphlet No. 94) is as follows: "Inadvertent interchange of a control area is the time integral of the net interchange power minus the
176 time integral of the scheduled net interchange. *Note.* This includes the intentional interchange energy resulting from the use of frequency bias as well as the unscheduled interchange energy resulting from human or equipment errors."

Q. Mr. JACOBSEN. Please define the term "control area" used in the preceding question.

A. A control area as defined by AIEE pamphlet No. 94, "Definitions of Terminology for Automatic Generation Control on Electric Power Systems" is, "a power system, a part of a system, or a combination of systems to which a common generation control scheme is applied."

Q. Does FPL constitute a control area?

A. Yes.

Q. Is each of the other members of the "Florida Pool" a control area?

A. Yes. F. P. Corp., Tampa Electric Company (TEC) and FPL all have automatic dispatching systems.

* * * * *

Q. On page 40, Mr. Jacobsen in his discussion of Exhibit 15, reaches the conclusion that interstate electric power flows over the interconnections from Georgia Power Company to
242 F.P. Corp. based on certain data, and "also the way the Florida Pool, F.P. Corp. and FPL operate." Do you agree with his conclusion?

A. No.

Q. Please state the area of disagreement.

A. The way the so-called "Florida Pool" and FPL operate have no bearing on the power that F.P. Corp. receives from Georgia Power. F.P. Corp.'s contract with the Southern Company is between those two companies whereas FPL's operating arrangement is only with F.P. Corp. We do not operate our system in such a fashion that would have any effect on these interstate transfers.

Q. Do the five Florida systems depend on any out-of-state systems to supply their required spinning reserve?

A. No, the Florida systems maintain a spinning reserve at least equal to the largest unit then running. F.P. Corp., in meeting its share of the required spinning reserves, does not consider any Suwannee generation or Southern Company interchange receipts, because such power would not be available following large generation losses due to the internal split that occurs on F.P. Corp.'s system under these conditions.

Q. On page 26 Dr. Jessel in reply to the question:

"Does FPL receive any benefits because of its connections to a large electrical network, through its ties to neighboring systems?"

Answered:

"Yes, it does. By being part of such network, FPL automatically benefits through better frequency and assistance during emergencies, and also realizes savings in spinning reserves and in generating reserves requirements."

Do you agree with his testimony, and if not, in what respect do you disagree?

243 A. No, I do not agree. As I have previously stated, FPL cannot and does not depend on out-of-state systems to help meet any generation deficiencies during emergencies; consequently, FPL cannot realize any savings in spinning

reserves or installed generating reserves. Furthermore, FPL does not have any better control of frequency when operating in parallel with the other ISG systems than it would have if it were to operate as a single isolated system. In fact, FPL's operation in parallel with the other ISG systems is purely fortuitous and of no benefit to FPL. It results solely from F. P. Corp.'s ties with the Southern Company systems.

Q. Mr. Bivans, assume that FPL were to operate as a single isolated system. Could FPL's present load frequency control equipment so regulate the frequency or would additional equipment have to be installed?

A. No additional equipment would have to be installed. Operation of the present load-frequency control equipment in the constant frequency control mode of operation is all that would be required.

Q. Now, Mr. Bivans, let us turn to the subject of time error and time error correction which Mr. Jacobsen discussed on page 62 of his testimony. During emergency periods when the five interconnected systems operated separated from the other ISG systems and possible time errors occurred, did FPL correct any time errors that may have occurred?

A. No, it did not.

Q. During the disturbances on February 24, 1965, what was the approximate time error?

244 A. Less than one second.

Q. Is time error made up before the five Florida systems tie back with the other ISG systems?

A. No, it is not.

Q. Do any FPL customers, including those with precision industrial operations suffer because such possible time errors are not corrected?

A. Not to my knowledge.

Q. Now, Mr. Bivans, let us discuss FPL's participation in the ISG.

Dr. Jessel, on pages 21 and 21A of his tesimony, states:

"It is important to note that in matching system generation to total system load (including scheduled transfers over interconnections) and in regulating frequency, all 140 electric systems in the Interconnected System Group (including FPL), a voluntary association of operating members from electric utility systems, depend in part on each other. It is generally

known that each important generating station in the Interconnected Systems Group is assigned an appropriate share or 'band' of generating capacity to be raised or lowered in the event of a system frequency deviation above or below a normal frequency band. The basic function of modern frequency and tie line control is, of course, that of regulating the total generating output in each individual system or control area in such a way that the total generation will match continuous and as closely as possible the total system load, including scheduled loads on interconnection ties."

Do you have any comments regarding this?

A. Yes, I do.

Q. Please state them.

A. First, with regard to tie-line bias control, each important generating station in the ISG and hence each system of the ISG is not assigned an appropriate share or "band" of generating capacity. In accordance with the Operating Rec-
245 ommendations of the ISG each system sets its frequency bias to a value not less than 1% of its annual peak load. In the case of FPL, this minimum recommended value of frequency bias, based on FPL's peak load for 1964 of 2372 mw, would be 24 mw.

Second, FPL does not depend on any other member of the ISG in order to match its system generation and system load. Neither does the FPL operate in such a manner as to be dependent on the ISG or any out-of-state member thereof. FPL's only contribution to the ISG is to operate in synchronism and assist its neighbors in the event of emergencies. The amount of aid that FPL can contribute by displacement through our neighbors to out-of-state members of the ISG who might be in trouble is negligible. This is true because FPL's response to loss of generation by out-of-state members of ISG is approximately the ratio of FPL's peak load to the total peak load of all members of ISG.

Furthermore this small contribution would be absorbed by neighboring systems in Florida and would never reach the state line some 180 miles away.

For example, as I previously testified, for the loss of the 580 mw of generation by a midwestern utility system as mentioned by Mr. Jacobsen on page 60 of his testimony, FPL's biased

scheduled net interchange was 8 mw, which by no stretch of anyone's imagination, could be considered to have crossed the state line let alone travel all the way to the Midwest. Electric companies have operated in synchronism or in parallel for many years. However, it does not follow that all transfers of power and energy between interconnected systems are interstate in nature.

246 Q. On page 25 of his testimony, Dr. Jessel states that:

"Each generating unit when operating at a speed corresponding to 60 cycles has mechanical energy of rotation stored in its rotating components, which is automatically convertible to electric energy when there is a decrease in frequency and corresponding drop in revolutions per minute. Thus, when a load is added suddenly to an electric system or a generator is taken suddenly out of service, every generating unit operating on the entire system of FPL and connected systems almost instantly experiences a loss in speed, so that the mechanical energy of rotation of every generator is converted to electric energy. The sum total of the electric energy so obtained through conversion from mechanical energy of rotation, supplies part of the new load or takes the place of some of the lost generation. The amount of assistance from this rotational energy source depends on the mass of the rotating equipment and the difference between the squares of the speeds for the conditions just prior to and just after the change in frequency."

Do you agree with this testimony?

A. No.

Q. Please explain.

A. In this part of his testimony, Dr. Jessel is referring to transient conditions instantly following a system disturbance. It is not correct to say that every generator on the ISG acts to supply a part of a sudden load increase or to compensate for the sudden loss of generation in one area of ISG. Relatively large load changes and generation losses on the system of an ISG member seldom cause any influence outside this system or its adjacent systems. This is because the change in instantaneous frequency brought about by such changes in load or generation is small enough that the primary result is a phase angle swing. The phase angle swing is of greatest magnitude nearest the disturbed area which then acts on the governors of the nearer

generators and may not affect remote generators where
247 the magnitude of phase angle swing is very small. Mr. Jacobsen recognized this as well as the displacement principle on page 63 of his testimony:

> "Normally, when there is a small loss of power in one electric system, the situation can be corrected through the power available from nearby electric utilities. Although the frequency meters in all interconnected systems will register the frequency change, the generators of the more distant systems probably will not be called upon to make a corrective contribution. However, in the case of an unusually heavy loss of power by an individual system, the reaction would be more far-reaching. Then, the more distant generators would provide power to those systems nearer the striken utility, which had already sent power into the affected area to assist in the correction of the loss."

In my opinion Dr. Jessel's discussion of the transient behavior of a power system is not pertinent to the question of whether FPL transmits electric energy in interstate commerce.

Q. On page 24 of his testimony, Dr. Jessel states that:

> "An electric system cannot supply one connected load and not supply another connected load. For any particular loading on an electric system, all of the electric energy produced by all of the generating units is delivered to the common transmission network which acts as a single unit from which all of the customers are supplied. For any change in a load or generation, there is an electrical effect through a change in voltage and current at all generators and at all loads."

Do you agree with this testimony?

A. No, I do not.

Q. Please explain.

A. Every load on an interconnected system is not supplied from all generators connected to that system. Each generator (or plant with several generators) will supply the load in an area radiating outward from it, and this area will depend
on the size of the generator (or plant), fuel cost at that
248 location, transmission losses and generating efficiency relative to other generators (or plants). On the FPL system, the allocation of load and hence the area in which the output of a generator or plant is consumed, is dictated by an

economic dispatch computer which continuously evaluates all these factors.

Should a generator be taken out of service, its output will be picked up by only those generators as dictated by the economic dispatch computer rather than shared by all generators.

Port Everglades generation may be increased to meet an increased load at Daytona Beach if this were the most economic generation available. This does not mean that energy would be actually transmitted from Port Everglades to Daytona Beach, but that the increase in generation on Port Everglades generators displaced generation from plants nearer the load change, which permitted those nearer plants to supply increased Daytona Beach load.

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366 CROSS EXAMINATION OF CLEVE R. JACOBSEN

By Mr. MERRIMAN:

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Mr. MERRIMAN. I would like to have marked for identification as Exhibit No. 55 a one-page document, entitled "Diagram D."

PRESIDING EXAMINER. That will be marked for identification as Exhibit No. 55.

(The document referred to above was marked for identification as exhibit No. 55.)

By Mr. MERRIMAN:

Q. Now, Mr. Jacobsen, what we have done here is we have taken the drawings, the lines shown on Diagram B and those on Diagram C, and we have characterized them as indicated by the dotted line, which shows where the new line goes across, and let's assume that there is twenty thousand Kw load added as indicated on the right-hand end, I would like to ask, then, Mr. Jacobsen, referring to Exhibit No. 55 which generators would be supplying which load under those circumstances.

Mr. MARTIN. Mr. Examiner, the Staff again would like to ask Mr. Merriman to state what kind of meter readings, whether integrated or instantaneous.

Mr. MERRIMAN. Let's assume instantaneous readings first.

The WITNESS. I would like to qualify my answer with
367 the fact again this is a hypothetical case. I would like to ask, are these transformer banks where you show the

load ten thousand Kw and twenty thousand and thirty thousand——

By Mr. MERRIMAN:

Q. We are neglecting losses.

A. Is that a transformer bank?

Q. Would it make any difference, Mr. Jacobsen?

A. I am asking you what it is.

Q. Assume first it is a transformer bank and then it isn't, and tell us the difference in your answer.

A. I was just going to show it wasn't a very practical situation, if you have got instantaneous readings here and there is a transformer bank. There you usually have an integrating type of reading on the transformer bank. But under the circumstances that you have set up, a very hypothetical condition, with the loads as shown, single-line diagram, I would say the twenty thousand Kw load tapped onto the dotted line would come from generator B.

PRESIDING EXAMINER. Why do you say that? What leads you to that conclusion?

The WITNESS. May I show it to you?

PRESIDING EXAMINER. Yes, please.

The WITNESS. This is the generator here. Generator A supplies the load to the right, fifty thousand. The generator B supplies a hundred kilowatts, which is the sum total of
368 all the other substation transformer loads.

Mr. SPIEGEL. Are we assuming that we have an alternating current system here?

Mr. MERRIMAN. Yes. Let's leave out the C in this proceeding.

By Mr. MERRIMAN:

Q. Would it make any difference in your answer, Mr. Jacobsen, whether the dotted line or dashed line, so to speak, that goes around to the right from the thirty thousand Kw load on the top around to the fifty thousand and beyond the fifty thousand load in the bottom, whether that was a transmission line or a bus bar?

A. If the point between the fifty thousand load and the twenty thousand load was a bus, I would say then that the power would be commingled on the bus.

PRESIDING EXAMINER. Would you read the question and answer?

(Record read.)

PRESIDING EXAMINER. Would you explain that answer?

The WITNESS. That is the method that I have used for treatment of a bus. A bus usually is a very small distance relative to the distance between the different load taps on the transmission line. Again that is why I say this is hypothetical, it is not realistic, because you ask a question like, that, I think you could take some cases that they have in the Florida Power and Light System, there are many things that you
369 have to consider. You would usually have two buses or maybe three buses, and you have switchers and you have breakers, and you have to know to which bus the transmission line is tapped. It affects the flow and the commingling of the interchange. I think this is too much of a hypothetical and not a realistic picture. They have plenty diagrams of the Florida Power and Light System; I have some here, which show that they usually have two buses and three breakers between these buses, and it is very difficult to say to which bus it is going to.

PRESIDING EXAMINER. Going back to the early part of your answer what particularly would lead you to conclude that there was commingling and where if the dashed line were a bus bar?

The WITNESS. In my treatment of the bus, the 50 Kw—the fifty thousand Kw load and the twenty thousand Kw load would be tied together.

PRESIDING EXAMINER. Is that because you treat the bus as a single point?

The WITNESS. Yes. The American Institute of Electrical Engineers recognize the substation as circuits being tied together. They are an accepted authority usually in their definitions.

Mr. MERRIMAN. I wonder if I could have that read?

PRESIDING EXAMINER. Where do you want it to begin?

Mr. MERRIMAN. Just the point about the Ameri-
370 can——

The WITNESS. Do you want me to read the definition?

Mr. MERRIMAN. I would like to hear the answer first.

(Record read.)

By Mr. MERRIMAN:

Q. Does that definition consider them tied together at a physical point, Mr. Jacobsen?

A. May I read it?

Q. Yes, please do.

A. "An assemblage of equipment for the sole purpose of tying

together two or more electric circuits through switches selectively arranged to permit a circuit to be disconnected as in the case of trouble or to change the electric connections between the circuits."

PRESIDING EXAMINER. That is the definition of what, substation?

The WITNESS. Switching substation.

PRESIDING EXAMINER. Switching substation.

By Mr. MERRIMAN:

Q. Mr. Jacobsen, again referring to Exhibit No. 55 for identification, which is Diagram D, if we place an indicating Kw meter in the top line between the thirty thousand Kw load and the twenty thousand Kw load—are you with me now——

A. I am with you.

Q. Then what would that meter read and the direction of flow?

371 A. Ignoring losses again, of course?

Q. Yes, sir.

A. It would read twenty megawatts.

Q. Mr. Jacobsen, assume that we put a meter in the dotted line between the twenty thousand Kw load at the top right of the diagram and the fifty thousand Kw load, which is also attached to the bottom line at the bottom, what would an indicating watt meter indicate if it was connected between those two points?

A. Is this a transmission line now with the five miles——

Q. Let's assume it is a transmission line with the five miles distance, indicating watt, again neglecting losses.

A. You probably wouldn't have any reading.

Q. It would be a zero reading then?

A. Yes.

Q. Let's assume, Mr. Jacobsen, that it is a bus bar rather than a transmission line. Then what would the reading be?

A. I am not sure. I have never seen houses with any indicating reading meters on a bus between points. That is a very short distance there.

Q. Are you saying that you have no knowledge of—your own personal knowledge—of a bus ever being metered? You have never heard of a bus being metered before?

A. Between circuits, no.

372 Q. Is there any reason, Mr. Jacobsen, why you couldn't put one there—one couldn't be put there?

A. Well, it would be very impractical in the first place. I think the reason that they are usually considered as a point—method——

Q. You mean you usually consider it?

A. Well, I have had quite a bit of design experience with substations.

PRESIDING EXAMINER. Well, for the moment, let's get off this problem.

By Mr. MERRIMAN:

Q. The question was whether it isn't possible, even though you say it isn't practical, is it possible to put a meter in between connections on a bus? Let's assume that the connections are three hundred feet apart, for example, on a bus, would it be possible to put a meter in there?

A. I suppose you could, but again I have never seen it done.

Q. Do you know any reason, Mr. Jacobsen, why you can't meter a bus?

A. Well, Mr. Merriman, usually you don't have just one bus: Usually there are one or more buses. And the value you would get there would be very meaningless.

Q. I didn't ask you that. I am going to let you comment after you answer the question. Let's assume you have
373 a single bus. Is there any reason why you can't—that you can't meter flows on a bus?

A. I don't suppose there would be, but I would hardly think you could classify it as a substation bus if you had just one bus there.

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By Mr. MERRIMAN:

Q. One other question, Mr. Jacobsen, isn't it the
379 purpose of a bus bar to carry power from where one line comes on and joins with a bus down, for example, to where another line takes off from the bus? In other words, you indicate about low resistance and so forth?

* * * * *

The WITNESS. A bus is used for tying together the different circuits that come in. It is also used to permit you to take switchers out of operation so that they can be tested. You have relay testing, the breakers are taken out, or if you want to examine the breaker characteristics. But it is true that a

bus is used to tie the different circuits together. It is a reservoir of getting the power distributed.

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Q. I would like to ask you this, Mr. Jacobsen: This has to do with commingling, so to speak. Do you consider commingling to be a concept or a fact?

A. Well, I consider it to be a fact. It is a harmonious union of two or more things. In this case it is negative electrons, the mass of which is about 9.1 times 10 to the minus 28, using scientific addition to describe it.

Q. Well, you lost me. In the Dairyland Case, the so-
282 called Dairyland Power Cooperative Case, Dr. Jessel said "Commingling is a concept, you understand, it is not a fact, it is a concept." He was asked that identical question in the Indiana-Michigan Electric Company proceeding in Docket No. E–7089, and he was asked if he didn't so testify, and he said he did. I assume by this you do not agree with Dr. Jessel on this point?

A. I have stated my——

Q. That is all right, you did accept that.

Let me ask you this: Do you know if this commingling, the fact of commingling, as you call it, has ever been verified experimentally?

A. No.

Q. How do you know it to be a fact?

A. You might use an analogy of different colored fluids, Mr. Merriman. If you have a red fluid and a blue fluid and you pour them together, you know that they are mixed. I have no—I do not remember of any experiments that have been made to prove definitely, but it is a common accepted fact, I believe, among the industry.

Q. That is kind of ending up where we started, when you say it is a commonly accepted fact in the industry. If Dr. Jessel has testified under oath twice that it is a concept, in his opinion it is a concept, not a fact, I think it is difficult to understand how you can say it is a commonly accepted fact in the industry. If you can say everybody that you know of
383 except Dr. Jessel believes this, then——

Mr. MARTIN. Mr. Examiner, Staff is going to have to object to the belaboring semantics here. Obviously, Mr.

Jacobsen and Dr. Jessel have approximately the same idea in mind. Whether Mr. Jacobsen thought of that as a fact or as a concept I don't think is particularly material at this point.

Mr. MERRIMAN. I am prepared to drop it right there, Your Honor, and go on. Let me ask you this, Mr. Jacobsen.

By Mr. MERRIMAN:

Q. Do you think in terms of—were you talking about fluids mixing—is it a hydraulic analogy that you have to the flow of electricity?

A. No. I was just getting across the mixing of electrons, comparing them.

PRESIDING EXAMINER. Going back to counsel's question to you with respect to Diagram D—do you have that before you?

The WITNESS. Yes, sir.

PRESIDING EXAMINER. You recall he asked you if you would assume that those dashed lines were a bus, and then he asked you to assume that a meter was put on the bus between the fifty thousand kilowatts and the ten thousand kilowatts. Then he asked you just before the recess, and I don't recall your answer, if you answered, would a meter, if one put it there, show a flow of current.

384 The WITNESS. On this hypothetical condition that they have here, it probably would not. But again this is not——

PRESIDING EXAMINER. You think it would read zero then?

The WITNESS. Yes. It probably would.

PRESIDING EXAMINER. What would it do if that were a transmission line five miles long?

The WITNESS. Without resistance it would be zero.

PRESIDING EXAMINER. Can you give it to me the other way? Suppose there were some resistance, what would happen?

The WITNESS. It would be the difference between twenty thousand and the amount of the power loss in the line due to the resistance of the transmission line.

PRESIDING EXAMINER. Would you read the answer back?

(Answer read.)

PRESIDING EXAMINER. Why twenty thousand?

The WITNESS. May I ask again where you wanted the——

PRESIDING EXAMINER. The meter was put between the twenty thousand load and the fifty thousand load.

The WITNESS. If you had resistance, that would be a case where you would almost have to have the losses in the line

before you could turn it. If there were losses, there is likely there would be flow depending on the length of the line and the resistance of the line.

PRESIDING EXAMINER. We are talking about the physical line or bar that would be between a load of fifty thousand
385 Kw and twenty thousand Kw. Now, as you said before, if that were to be considered as a bus, there would be no current flowing, am I correct?

The WITNESS. Yes, sir.

PRESIDING EXAMINER. And that is virtually zero resistance?

The WITNESS. Yes, sir.

PRESIDING EXAMINER. But if there were resistance there, then what wouldd happen and why? Also, how much resistance would you suggest?

The WITNESS. Assuming that there is resistance in the bus, there would be resistance all the way back to the generators. Then you would have to start back here and take into consideration the drop between the generator and each point of load, which would make it an entirely different situation, depending upon the length of these lines.

PRESIDING EXAMINER. I take it you assumed no resistance up to now, didn't you?

The WITNESS. That was the case.

PRESIDING EXAMINER. Everything is the same except there is resistance between the fifty thousand and the twenty thousand load?

The WITNESS. If this was the bus here, sir.

PRESIDING EXAMINER. The bus is the case without resistance, and the other is with resistance?

386 The WITNESS. In both cases if it were bus, I consider it commingled.

PRESIDING EXAMINER. In the bus case, let's call it zero resistance, the meter would show zero. In the case where there was resistance of a significant amount, what would the meter show?

The WITNESS. The meter would probably show——

PRESIDING EXAMINER. It is not a bus; it is a line now, the five mile transmission line.

The WITNESS. It would still be zero there, if I get your case. Between this point and this point here, is that it?

PRESIDING EXAMINER. Between the twenty thousand Kw load and the fifty thousand Kw load there is a wire which has some resistance, the normal resistance of a five mile wire?

The WITNESS. Yes, sir.

PRESIDING EXAMINER. Everything else remains the same. Would a meter placed between the fifty thousand Kw load and the twenty thousand Kw load show anything?

Mr. MARTIN. Mr. Examiner, would you differentiate that as an integrating or an instantaneous?

PRESIDING EXAMINER. Take it first as instantaneous and integrating.

The WITNESS. It would be zero.

PRESIDING EXAMINER. For instantaneous?

The WITNESS. Yes, sir.

387 PRESIDING EXAMINER. Now for integrating.

The WITNESS. You would have to make some more assumptions if it was integrating. If these loads all here were simultaneous, as we are talking about readings, and there were no change in the load, it would still be zero. As pointed out, this is not a very practical situation because the loads are constantly changing, and an integrating meter will not give you a simultaneous or instantaneous condition— simultaneous flow instantaneous.

PRESIDING EXAMINER. Can you make the assumption of constant flow?

The WITNESS. Constant load?

PRESIDING EXAMINER. Yes.

The WITNESS. Hypothetically, you could, but I don't think it would mean a great deal. I think you could make a hypothetical case and prove almost anything instead of a practical situation. You have a diagrammatic electric utility system, and you can't very well make a diagram of hypothetical conditions and say they are constant loads and say they are instantaneous readings whenever a load like this is integrating.

PRESIDING EXAMINER. The first case I put to you was instantaneous, and you said there it would be zero. Then the second case I gave you was an integrated reading.

The WITNESS. Yes.

PRESIDING EXAMINER. Then what would happen?

388 The WITNESS. A constant load on each one of these——

PRESIDING EXAMINER. By these you mean the other four?

The WITNESS. All the leads, yes,—over the period of the integrating reading, if it is an hour, it has to be a constant load for an hour. Then you would still get——

PRESIDING EXAMINER. Zero?
The WITNESS. Yes.

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618 CROSS EXAMINATION OF JOSEPH J. A. JESSEL

By Mr. MERRIMAN:

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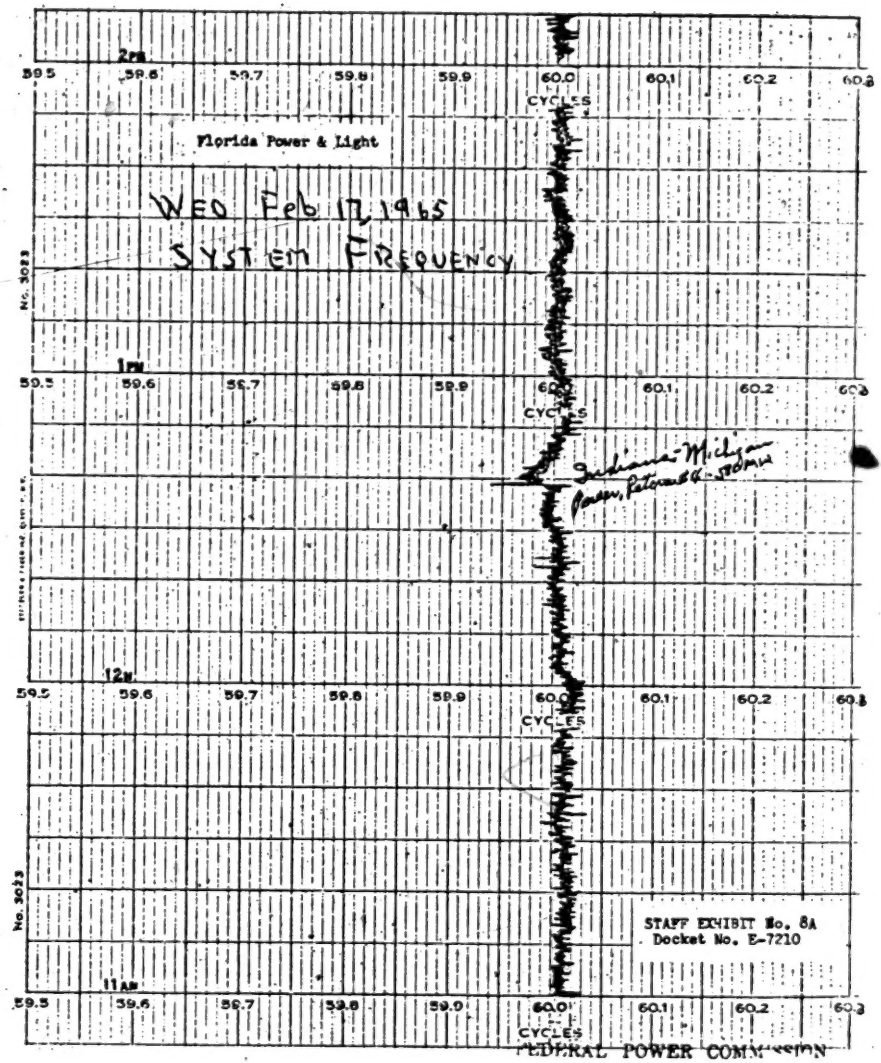
PRESIDING EXAMINER. * * * I have one basic question to ask you that might be just—I will ask it to you now. I am sure I would understand it better after Mr. Bivans has testified. But the question is basically why is your commingling theory right and why is his theory of systems study method wrong?

The WITNESS. I think the——

619 PRESIDING EXAMINER. Perhaps you would care for me to rephrase the question.

The WITNESS. Yes.

* * * * *



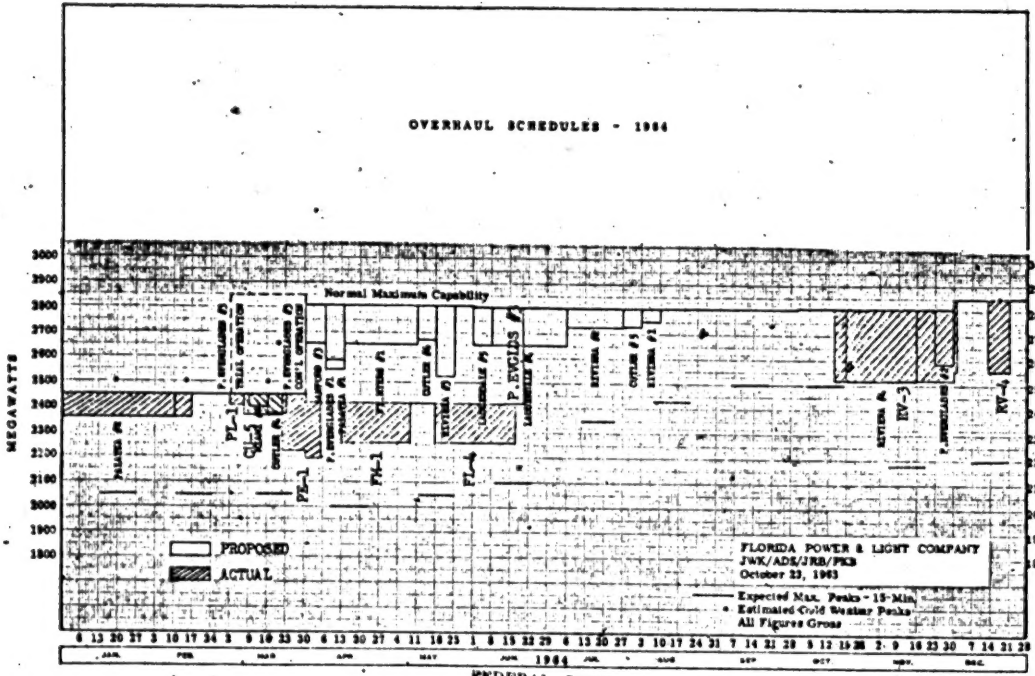
FEDERAL POWER COMMISSION

Docket No. E-7210

Hearing Ex. No. 8A

Date Identified OCT 4 1965

Date Admitted OCT 4 1965



FEDERAL POWER COMMISSION

Docket No. E-7210

Hearing Ex. No. 9

Date Identified OCT 4 1965

Date Admitted OCT 4 1965

STAFF EXHIBIT No. 9
Docket No. E-7210

1096 [Certified Copy, July 12, 1966]

[Federal Power Commission, Docket No. E-7210; Hearing Ex No. 29, Date identified, Oct. 4, 1965; Date admitted, Oct. 4, 1965.]

DEFINITIONS OF TERMS—ELECTRIC POWER SYSTEMS

A1 *Analog Device.*—An analog device is one which operates with variables represented by continuously measured quantites such as voltages, resistances, rotations, pressures, etc.

A2 *Area Frequency—Response Characteristic.*—The area frequency-response characteristic of a control area is the sum of the change in total area generation caused by by governor action and the change in total area load, both of which result from a sudden change in system frequency, in the absence of automatic control action.

A3 *Automatic Dispatching System.*—An automatic dispatching system is a controlling means for maintaining the area control error or station control error at zero by automatically loading generating sources, and it also may include facilities to load the sources in accordance with a predetermined loading criterion.

C1 *Control Area.*—A control area is a power system, a part of a system or a combination of systems to which a common generation control scheme is applied.

C2 *Cost of Incremental Fuel.*—Cost of incremental fuel, usually expressed in cents per million Btu, is the ultimate replacement cost of the fuel that would be consumed to supply an additional increment of generation.

1097 E1 *Energy Metering Point.*—The energy metering point of a tie line is the location of the integrating metering equipment used to measure power flow on the tie line.

F1 *Frequency Deviation.*—Frequency deviation of a power system is system frequency minus the scheduled frequency.

F2 *Frequency Standard.*—A frequency standard is a device that produces a precise alternating frequency intended to be used as a frequency reference.

I1 *Inadvertent Interchange.*—Inadvertent interchange of a control area is the time integral of the net interchange power minus the time integral of the scheduled net interchange.

I2 *Incremental Cost of Delivered Power.*—Incremental cost of delivered power of a source is the additional per unit cost that would be incurred in supplying another increment of power from that source to the composite system load.

I3 *Incremental Fuel Cost of Generation.*—Incremental fuel cost of generation for any particular source is the cost, usually expressed in mills/kwhr, that would be expended for fuel in order to produce an additional increment of generation at any particular source.

I4 *Incremental Heat Rate.*—The incremental heat rate of a steam turbo-generator unit at any particular output is the ratio of a small change in heat per hour input to the corresponding change in power output. Usually it is expressed in Btu/kwhr.

1098 I5 *Incremental Maintenance Cost.* Incremental maintenance cost for any particular source is the additional cost for maintenance that will ultimately be incurred as a result of increasing generation by an additional increment.

I6 *Incremental Transmission Loss.*—Incremental transmission loss is that fraction of power loss incurred by transmitting a small increment of power from a point to another designated point. One of these points may be mathematical (rather than physical), such as the composite system load.

I7 *Interconnected System.*—An interconnected system consists of two or more individual power systems normally operating in synchronism.

L1 *Lambda.*—Lambda is the incremental cost of received power in mills/kwhr.

L2 *Load-Frequency Control.*—Load-frequency control is the regulation of the power output of electric generators within a prescribed area in response to changes in system frequency, tie line loading, or the relation of these to each other, so as to maintain the scheduled system frequency and/or the established interchange with other areas within predetermined limits.

N1 *Net Generation.*—Net generation is gross generation less station or unit power requirements.

N2 *Net Interchange Deviation.*—The net interchange deviation of a control area is the net interchange power minus the scheduled net interchange.

N3 *Net Interchange Power.*—The net interchange power of a control area is the algebraic sum of the power flow on the area tie lines. Positive net interchange due to excess generation is considered as power out of the area.

1099 P1 *Power Pool.*—A power pool is two or more electric systems interconnected and coordinated to supply power in the most economical manner for their combined load requirements and maintenance program.

P2 *Power System.*—A power system is a group of one or more generating sources and/or connecting transmission lines operated under common management or supervision to supply a load.

S1 *Scheduled Frequency.*—The scheduled frequency is that frequency which a power system or an interconnected system attempts to maintain.

S2 *Scheduled Net Interchange.*—The scheduled net interchange of a control area is the mutually prearranged intended net power flow on the area tie lines.

S3 *Speed Governor.*—The speed governor includes only those elements which are directly responsive to speed and which position or influence the action of other elements of the speed-governing system.

S4 *Speed-Governing System.*—The speed-governing system includes the speed governor, the speed-control mechanism and the governor-controlled valves.

S5 *Station High and Low Limits.*—Station high and low limits are adjustable extremes beyond which automatic control action to the station is suspended.

S6 *Supplementary Regulation.*—Supplementary regulation shifts generation between alternative sources after initial governing responses have resulted in loadings which it is not desired to maintain.

S7 *System Frequency.*—System frequency is the number of cycles per second of the power system alternating voltage.

1100 S8 *System Requirement.*—The system requirement of a control area on an interconnected system is the net interchange power minus the biased scheduled net interchange. If the frequency bias is zero, the area control error is the net interchange deviation.

S9 *Service Area.*—Territory in which a utility system is required or has the right to supply electric service to ultimate customers.

T1 *Tie Line.*—A tie line is a transmission line connecting two or more power systems.

T2 *Tie Point.*—The tie point of a tie line is the location of the switching facilities which, when closed, permits power to flow between the two power systems.

T3 *Transmission Loss Coefficients.*—Transmission loss coefficients are mathematically derived constants to be combined with source powers to provide incremental transmission losses from each source to the composite system load. These coefficients may also be used to calculate total system transmission losses.

T4 *Tie-Line Bias Control.*—Tie-line bias control of a control area is a mode of operation under load-frequency control in which the area control error is determined by the net interchange power minus the biased scheduled net interchange.

Diagram D

FEDERAL POWER COMMISSION
Docket No. E-7210
Hearing Ex. No. 55
Date Identified OCT 4 1965
Date Admitted OCT 8 1965

CERTIFIED COPY
JUL 12 1966

Exhibit No. 55
Docket No. E-7210

In the United States Court of Appeals for the Fifth Circuit

No. 24956

FLORIDA POWER & LIGHT COMPANY, PETITIONER

v.

FEDERAL POWER COMMISSION, RESPONDENT.

PETITION TO REVIEW AND SET ASIDE OPINION AND ORDERS OF THE FEDERAL POWER COMMISSION (FLORIDA CASE)

(July 13, 1970)

Before BELL, AINSWORTH and GODBOLD, *Circuit Judges.*

GODBOLD, *Circuit Judge:* Florida Power & Light Company (FPL) petitions for review of a determination,[1] reached by the Federal Power Commission on a 3–2 vote, that it is a public utility within the meaning of § 201 of the Federal Power Act, 16 U.S.C. § 824(e). We reverse the Commission and set aside its order.

The term "public utility" means "any person who owns or operates facilities subject to the jurisdiction of the Commission under sections 824–824h of this

[1] 37 F.P.C. 544.

title." 16 U.S.C. § 824(e). "The provisions of sections 824–824h of this title shall apply to the transmission of electric energy in interstate commerce and to the sale of electric energy at wholesale in interstate commerce * * * The Commission shall have jurisdiction over all facilities for such transmission or sale of electric energy." 16 U.S.C. § 824(b).

The Commission asserts jurisdiction on the ground that FPL owns and operates facilities for the transmission of electric energy in interstate commerce. Jurisdiction over interstate wholesale sales under § 824(b) is not involved.

1. BACKGROUND

FPL's facilities are located wholly within the State of Florida. It has no connections at the state line with any out of state system. Commission jurisdiction is predicated on transmission interstate of FPL-generated power through its interconnection with other electric systems outside of and within Florida, and receipt by FPL, through these interconnections, of power generated outside of Florida.

Congress exercised its power under the Commerce Clause and undertook federal regulation in the interstate electric field as a result of the decision of the Supreme Court in *Public Utilities Commission of Rhode Island v. Attleboro Steam & Electric Co.*, 273 U.S. 83, 71 L.Ed. 549 (1927), holding that neither Massachusetts nor Rhode Island had power to regulate the sale by a Rhode Island utility of electric energy to a Massachusetts utility because the sale was in interstate commerce. There being at that time no federal regulation of interstate sales by electric utilities, Congress acted to close this gap in effective

utility regulation, the "Attleboro gap," by enacting Part II of the Federal Power Act in 1935.

Jurisdiction of the FPC is not based upon a test of effect on interstate commerce but upon interstate transmission of electric energy (or wholesale sales in interstate commerce, not here applicable). 16 U.S.C. § 824(b). To make clear that Commission jurisdiction extends only to transmission or sales "in interstate commerce," the Congress wrote several specific exclusions into the Act.

> * * * such Federal regulation, however, to extend only to those matters which are not subject to regulation by the States.

16 U.S.C. § 824(a). This caveat and the directive that the Act.

> shall not apply to any other sale of electric energy or deprive a State or State commission of its lawful authority now exercised over the exportation of hydro-electric energy which is transmitted across a State line * * *,

16 U.S.C. § 824(b), extend Commission jurisdiction to the limits of but no further than the Attleboro gap. *Connecticut Light & Power Co.* v. *FPC,* 324 U.S. 515 89 L.Ed. 1150 (1945); *Jersey Central Power & Light Co. v. FPC,* 319 U.S. 61, 87 L.Ed. 1258 (1943).

> Likewise, the Commission shall not have jurisdiction, except as specifically provided * * * over facilities used for the generation of electric energy or over facilities used in local distribution or only for the transmission of electric energy in intrastate commerce, or over facilities for the transmission of electric energy consumed wholly by the transmitter.

16 U.S.C. § 824(b). Exemptions are also provided for governmental units and corporations, 16 U.S.C. § 824

(f), for one engaged in transmission or sale of electric energy but not otherwise subject to the Act who makes a temporary emergency connection with a public utility subject to the jurisdiction of the Commission, 16 U.S.C. § 824a(d), and for certain international exports, 16 U.S.C. § 824a(f).

Congress defined interstate transmission as follows:

> [E]lectric energy shall be held to be transmitted in interstate commerce if transmitted from a State and consumed at any point outside thereof.

16 U.S.C. § 824(c). The Supreme Court has credited the Congress with determining that "federal jurisdiction was to follow the flow of electric energy, an engineering and scientific rather than a legalistic or governmental test." *Connecticut Light & Power Co. v. FPC, supra.* Commission power does not extend over all connecting transmission facilities but only those which transmit energy actually moving in interstate commerce. Mere connection determines nothing. *Jersey Central Power & Light Co. v. FPC,* supra, at 72, 87 L.Ed. at 1269.

The concept of following the flow of electric energy from one state to the other was easy to apply in *Attleboro.* A Rhode Island electric company delivered energy over its Rhode Island transmission lines to the facilities of a Massachusetts electric company which had no generating capacity. Now generating companies are interconnected with each other nationwide. Companies have formed area and regional power pools, with varying degrees of integration and centralized management. The Commission itself has power to establish regional districts for voluntary interconnection and coordination of facilities and to promote such interconnection and coordination. 16 U.S.C. § 824a(a).

Interconnection has become a fact of life to meet needs, scheduled and emergency, of localized areas and large regions.[2]

2. THE INSTANT CASE.

FPL produces and sells electric energy in eastern and southern Florida. But it is a major electric company.[3]

The Commission opinion describes FPL's interconnections:

> FPL is directly interconnected with four other Florida electric systems, as follows: Florida Power Corporation (Corp), Tampa Electric Company (Tampa), Orlando Utilities Commission (Orlando), and the City of Jacksonville (Jacksonville). FPL, Corp, and Tampa form the Florida Operating Committee (Florida Pool) with Jacksonville and Orlando as associate members. The Florida Pool meets several times a year to consider mutual problems relating to the interconnected operation of the systems, including the coordination of spinning reserves, the arrangement of compatible plant maintenance schedules, and the coordination of plans for the construction of transmission lines and the staggered construction of generating units.
>
> * * * * *

[2] The examiner noted the Northeast power failure of 1965, which plunged large sections of the eastern United States into darkness.

[3] In 1965 it served nearly one million customers, ranked ninth nationally among electric companies in revenues, fourteenth in investment in gross electric utility plant, and sixteenth in kilowatt hour sales. Six of its customers are electric cooperatives, and it occasionally sells to municipal electric systems on an emergency basis. Because of the frequent threat of hurricanes severing its transmission lines, FPL attempts to be self-sufficient, even within different segments of its system.

Corp, which is interconnected with Tampa and Orlando as well as with FPL, is also interconnected with power companies outside of the State of Florida. Thus, it is directly interconnected with Georgia Power Company (Georgia), a subsidiary of The Southern Company (Southern). Southern is a holding company whose other subsidiaries are Gulf Power Company (Gulf) which operates in northwestern Florida, Alabama Power Company (Alabama), and Mississippi Power Company (Mississippi). Corp is also directly interconnected with Gulf, and Gulf is interconnected with Georgia and Alabama. Corp has an agreement with the subsidiaries of Southern whereby Corp makes 100,000 kw available to these subsidiaries during the summer, and in return, the subsidiaries make 100,000 kw available to Corp during the winter. During 1964 Southern delivered 167,476,000 kwh to Corp, and Corp delivered 157,324,000 kwh to Southern. Of these totals, approximately 97,000,000 kwh represented deliveries from Georgia to Corp, and 82,000,000 kwh represented deliveries from Corp to Georgia. In addition, 3.9 million kwh were wheeled for the Southwestern Power Administration over Southern's lines across the Georgia-Florida state line to Corp. Georgia is also interconnected with Duke Power Company, Tennessee Valley Authority, and Southeastern Power Administration. These systems operate in states beyond Georgia.

FPL and the other members of the Florida Pool are also members of a multi-state electric network, the Southeast Region of the Interconnected Systems Group (ISG) which covers the southeastern and central portions of the United States. FPL's membership in the ISG provides acceptable frequency control and also automatic assistance during emergencies in the event of any generation outage of less than

100 mw on its system. In this connection it may be noted that 12 of FPL's 24 generating units generate 75 mw or less. An outage of any of these units would lead to almost instantaneous assistance to FPL. FPL, in turn, operates in synchronism with the 140 members of ISG and is ready to assist them in case of emergency. Thus, FPL contributed 8 mw to ISG to assist a midwestern utility which had sustained a 580-mw generator loss.

The Commission position is best explained by quoting from its opinion:

> The testimony and evidence of record support the examiner's findings that the electric power on all the interconnected systems in which FPL, Corp, and Georgia participate is supplied as alternating current at a frequency of 60 cycles; that the frequency of each system is in synchronism with that of all the others in the interconnection; that there is a tie-line bias with frequency control on the interconnected systems which permits a free flow of power and energy throughout the networks in which FPL, Corp, and Georgia participate; that all 140 members of the ISG operate in parallel and are interlocked electromagnetically; and that FPL can receive from or contribute to ISG up to 100 mw. The record further supports the examiner's findings that FPL normally has no control over the actual transfers of electric power and energy with any particular electric system with which it is interconnected; that since electric energy can be delivered virtually instantaneously when needed on a system at a speed of 186,000 miles per second, such energy can be and is transmitted to FPL when needed from out-of-state generators, and in turn can be and is transmitted from FPL to help meet out-of-state demands; and finally, that there is a cause and effect relationship in electric

energy occurring throughout every generator and point on the FPL, Corp, Georgia, and Southern systems which constitutes interstate transmission of electric energy by, to, and from FPL.

In its exceptions FPL argues that there is no substantial record support for the examiner's finding that it is engaged in the transmission of electric energy in interstate commerce. We find no merit in this argument. The examiner concluded that the operation in FPL in electromagnetic unity with the suppliers in and outside of Florida in and of itself demonstrated that it owned and operated facilities for the interstate transmission of electric energy. This finding is also supported by the evidence produced by staff at the hearing which convincingly establishes that electric energy is transmitted in interstate commerce to and from FPL's lines.

The Commission adopted the examiner's findings. Two are basic. First, that ownership and operation of facilities for interstate transmission was proved by reason of FPL's interconnection with other systems inside and outside of Florida "in electromagnetic unity of response," without any necessity of tracing the path of any interstate electrical energy. Second, that if tracing was considered essential, there had been interstate transmission to and from FPL's lines, based on the Commission's staff studies, which were predicated upon the "commingling theory" of the transmission of electric energy. It is not clear to us whether the examiner and the majority of the Commission considered commingling as undergirding the electromagnetic unity of response theory or as irrelevant to it. The dissenters appeared to treat the two concepts as one, pursuant to which at all times an interconnected network is "permeated" with free flowing electric energy.

The nature and effects of the concept of "electromagnetic unity of response" were described by the examiner approximately as follows. The interconnected systems supply alternating current on the same frequency, 60 cycles per second, with the frequency of each system in synchronism with that of all other systems in the interconnection. The speed of all generators on the interconnected systems is irrevocably locked to the same frequency. A response mechanism known as tie line bias control regulates output in individual systems so that total overall generation matches as closely as possible the total overall load. When at any point a change in load occurs or a generator is taken out of service, this will affect every point on the interconnected systems. For example, every connected generator on the interconnected systems will contribute energy to compensate for any additional load to maintain the balance between total overall generation and total overall load and thereby maintain frequency at 60 cycles. The immediate effects of load or generation changes are dispersed throughout the electromagnetically interlocked generators of the interconnected systems. The magnitude of change in instantaneous generation and frequency will tend to diminish as the distance from the point of load or generation change increases. As such changes occur tie line bias control operates to restore the net interchange of power between each system and its neighbors to the former prearranged level.[4]

[4] The automatic, nonscheduled transfers effected by tie line bias control are not the sole or even the most important transfers among systems. For a variety of reasons, electric companies agree to swap power. Scheduled transfers include seasonal sales, like those between Southern and Corp; other economy sales, made profitable by differences in marginal efficiency among production plants, Indiana and Michigan Electric Co. v. FPC, 365

In our example above, the particular system on which total load increased will automatically increase its own generation to supply the additional load, and the other systems correspondingly will reduce their temporarily increased electric generation. No attempt is made to control flows of electric energy in individual lines (in fact, electric systems normally have no control over actual transfers of energy between them, if there is more than one interconnection), because the flows are determined by the electric characteristics of the overall network. Only the net of flows is controlled, by increasing or decreasing generation so as to maintain scheduled transmissions of power (both within a system and between systems). Thus there is free flow of electric energy throughout the overall network but limited by control of the net of flows, frequency changes, tie line bias, and the responses of generators to load changes.

The examiner stated that nobody can say for certain just how electricity is really transmitted, but that "the answer is not important for legal purposes." He found:

> The cause and effect relationship in electric energy occurring throughout every generator and point on the Georgia, Corp and Florida systems constitutes interstate transmission of electric energy by, to, and from Florida. It is the electromagnetic unity of response of Florida, Corp, Georgia and other interconnecting systems that constitutes the interstate transmission of electric energy by Florida.

F.2d 180 (7th Cir.), *cert. denied*, 385 U.S. 972, 17 . 2d 435 (1966); and transfers to compensate for tempora ds such as plant maintenance, as in the Florida Operati mittee arrangements.

We conclude that the complex relationship of cause and effect in interconnected and synchronized systems is, as to FPL, not sufficient to prove the actual transmission of energy interstate. It tells us what, as to that company, could occur. It does not tell us with any substantial degree of certainty what does occur.

This is not to say that "electromagnetic unity of response," with the reasonable inferences which may be drawn therefrom, may not be a part of substantial evidence of interstate transmission, as in the "power pool" cases discussed below. But, standing alone, as to FPL it is not substantial evidence establishing that when energy flows from Corp's lines to Georgia's lines, either scheduled or in response to frequency drop in the state of Georgia or somewhere further distant, the Florida power transmitted is Corp's plus FPL's and not Corp's alone, and conversely that when energy flows from Corp to FPL it is not Corp's alone but mixed with power generated outside Florida.[5] The Commission referred, at the end of the excerpt first above quoted, to FPL's contribution of 8 mw to ISG during an outage in the midwest. That "contribution" does not necessarily mean that power was transmitted interstate from FPL to the midwest. Although the effect of FPL's transmission was to increase the total wattage available to the whole system,

[5] We have focused, as did the examiner and the Commission, on interstate transmission in terms of FPL's interconnection with Corp. But the theory of interconnection and synchronization is applicable to the outermost ends of all interconnected systems. Thus, under this theory a direct interconnection of FPL with Corp is unnecessary because, for example, FPL interconnects with Tampa and Orlando in the Florida Pool, and those two companies are interconnected with Corp, which interconnects to Gulf, which interconnects to Alabama.

the "electromagnetic unity of response" theory is equally compatible with either the Commission's "permeation" assumption or the hypothesis that the power transmitted by FPL was consumed by Corp, another eight mw being passed on by Corp for further use or transmission.

Turning to the second basic finding of energy actually traced, the supporting evidence of actual transmissions referred to by the Commission consists of staff studies purporting to trace energy from Georgia through Corp's substation in Florida into FPL's system, and at other times over the same lines from FPL to Corp to Georgia. These studies are predicated upon the commingling theory, which is simply a method of conceptualizing the complex and not yet fully explainable flow of electric energy. FPL asserted the validity of a different theory, the "systems study method."[6] The difference between this method and the commingling method relied on by the Commission lies in their assumptions about the nature of the transmission bus, a collection and transmission facility for electric power, for example, a substation. The systems study method assumes that it is possible to measure the magnitude and direction of flows within a bus as well as along transmission lines between buses. Relying on this assumption, FPL introduced measurements tending to show that for each point in time at which the Commission attempted to trace power from Georgia to FPL there was in fact a reversal in flow through the bus away from FPL's connection either on the Corp-FPL bus or on some other bus earlier in the trace through Corp's system. Finding on each bus

[6] This is a variation of the so-called steady state method used for accounting and planning purposes in the electric power industry.

the connection which brought power from the direction of Georgia, and totaling the inputs and outflows through other connections on the bus in the direction of FPL's connection, FPL calculated that inputs over this part of the bus were greater than outflows. Under the systems study assumptions, then, power could only flow in the opposite direction through the bus, away from FPL's connection.

The staff did not disprove the correctness *vel non* of these measurements by FPL.[7] Instead the staff urged that the steady state method of describing the flow of three-phase power is inadequate and that the flow is best conceptualized by the commingling theory.

Modern electric utilities generate alternating current electricity. The steady state method treats the flows and counterflows of alternating current as unidirectional and measures only the net of the flows and counterflows. This simply ignores that alternating current is not unidirectional.[8] The commingling concept too treats power flows as only net quantities. But the bus is treated as a "tank" or a "reservoir." The energy flowing to each load on the bus is attributed to each source of energy in the proportion that the source contributes to the total energy flowing into the bus. If at any instant the net flow of power is toward a system—that is, its load is more than its generation—it is assumed that at that moment some portion of the

[7] Counsel for the Commission attempted to do so by a chart, first presented on appeal, which purported to show by the steady state method that interstate power reached FPL. The petitioner did not have a chance to question or controvert in a factual hearing assumptions underlying this chart, so we may not consider it on this appeal.

[8] Staff experts testified that the deficiencies of the steady state method could be corrected by measuring counterflows of energy.

power being consumed by that system flowed into it from every other system contributing to the "tank" or "reservoir" at the bus.[9] Neither the examiner nor the Commission treated the commingling theory as a scientific fact depicting accurately what does occur but only as the more adequate way to conceptualize actual occurrences.[10]

The Commission expert witness Jacobsen acknowledged commingling has never been verified experimentally as fact. The following interchange took place during the hearing before the examiner:

> PRESIDING EXAMINER. I take it the theories are not necessarily right or wrong. How does your theory better explain the facts?
>
> THE WITNESS. [Commission expert]: I think that would be a better question.

In some contexts the commingling method may be a more useful tool for analysis than steady state methods, but this is not to say that it is adequate for all purposes. Both suffer from the same vice of creating a construct which departs from the actual manner in which electricity operates and then attempting to trace the consequences. The engineering and scientific fact test for interstate flow of energy is not met by postu-

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[9] Although we do not rest our decision on this testimony, we note that an expert for FPL calculated that, if it be conceded that commingled power flowed from Georgia to FPL under the Commission's assumptions, the interstate component of the power flowing from Corp into the FPL substation at Sanford, Florida would be only 0.07%, and that as a portion of the energy then being delivered by FPL to its consumers, this interstate energy would amount to only 0.00015%.

[10] Thus the examiner stated:

> "[S]everal explanations may be sufficient [to account for the amount of electric energy at any one point] but none may possess the uniqueness necessary for proof."

lating a simplified characterization of how, for various purposes of convenience, energy may be treated as flowing.

3.

The "engineering and scientific" test based on actual power flow was articulated in *Connecticut Light & Power*. In that case, in the next following words the Supreme Court said:

> Technology of the business is such that if any part of a supply of electric energy comes from outside of a state it is, or may be, present in every connected distribution facility.

324 U.S. at 529, 89 L.Ed. at 1160. We do not construe this language as obviating the necessity for showing interstate transmission of power. In context the Supreme Court was discussing not the technological transmission test but the exception from FPC jurisdiction of "facilities used in local distribution." 16 U.S.C. § 824.

The Commission bears the burden of proving its asserted jurisdiction. *Public Service Co. of Indiana v. FPC,* 375 F.2d 100, 104 (7th Cir.), *cert. denied,* 387 U.S. 931, 18 L.Ed. 2d 992 (1967); *Arkansas Power & Light Co. v. FPC,* 368 F.2d 376 (8th Cir. 1966). In attempting to meet this burden, the Commission does not rely upon the two "straight status" cases that have been adjudicated by the Supreme Court, *Connecticut Light and Power* and *Jersey Central,* neither of which supports its approach in this instance. Instead it turns to the cases in which jurisdiction has been found over wholesale sales "in interstate commerce" and adapts their methodology. *Cincinnati Gas & Elec. Co. v. FPC,* 376 F.2d 506 (6th Cir.), *cert. denied,* 389 U.S. 842, 19 L.Ed. 2d 106 (1967); *Public Serv-*

ice Co. of Indiana v. FPC, supra; Arkansas Power & Light Co. v. FPC, supra; Indiana and Michigan Electric Co. v. FPC, 365 F.2d 180 (7th Cir.), *cert. denied,* 385 U.S. 972, 17 L.Ed. 2d 435 (1966); see also *Pennsylvania Water & Power Co. v. FPC,* 343 U.S. 414, 96 L.Ed. 1042 (1952). *Pennsylvania Water* concerned wholesale sales of an admitted public utility, as defined by the Act, which was part of a system integrated with a Maryland company. During periods of low flow on the Susquehanna River it received substantial amounts of power from the Maryland company, and it was not contested that some interstate energy reached each of its customers.

Each of the four companies in the "power pool" cases from the Sixth, Seventh and Eighth Circuits was likewise a public utility within the meaning of the Act. Each of them also participated in an integrated power pool centrally directed to maximize efficiency by economy transfers and to provide emergency power. CG&E, PSCI and I&M were all members of the American Electric Power System (AEP) spanning several midwestern states, and Arkansas Power & Light was a member of a similar pool operation including utilities in three southern states.

Each of these cases rests on far more than interconnection plus electromagnetic unity of response plus commingling. In both *CG&E* and *Arkansas Power & Light,* limited samples showed that some of the petitioners' wholesale customers received out of state energy. In each case, the company's principal contention was that tracing was necessary to establish the presence of out of state energy in its wholesale transmissions to its remaining customers as well. In each case the utility's membership in a pool, and its consequent regular purchases for economy and other rea-

sons of power generated in other states, justified an inference that not just some but all of its wholesale sales contained interstate energy.

In *I&M* and *PSCI*, the Commission traced no interstate energy to any wholesale customer. In *I&M*, this may have been unnecessary, since there was evidence that for substantial periods of time Illinois energy supplied at least large portions of north central Indiana and southwest Michigan, thereby bringing this case close to *CG&E* and *Arkansas Power & Light*, *PSCI* is the most far-reaching case. But the court in that case rested squarely on *I&M*, finding that the company's participation in the integrated AEP network, in view of the impossibility of tracing, justified the inference that some of the interstate power which demonstrably flowed in PSCI's lines reached each of its wholesale customers.

We agree with the court in *Arkansas Power & Light, supra*, at 383, n.8, that establishing wholesale rate jurisdiction over an electric company which is a public utility within the Act is a different matter from establishing plenary jurisdiction over a company based on interstate transmission. A consideration in the wholesale sale case is the seeming irrationality of allowing Commission jurisdiction over wholesale sales to which experts can trace some out of state energy, but not over those to which it might be impossible to trace interstate power, when it is obvious that there is interstate power in substantial portions of the utility's system. *Cf Arkansas Power & Light, supra.* Another consideration is the seeming irrationality of a public utility with interstate electric energy flowing in its system escaping FPC jurisdiction over wholesale sales because of impossibility of proof arising from the inadequacy of instruments used by the utility itself. *Cf. Indiana & Michigan, supra.* These con-

siderations have little application to the problems of federalism and reservations of power to the states imposed by the instant case, where the issue is one of whether FPL is a public utility at all, measured under tests articulated by the Congress and the courts in terms of actual transmissions of interstate energy.

Some of the wholesale rate cases have relied heavily on the respective companies' participation in an integrated interstate power pool, which provided power more or less continuously, in substantial amounts, and with economy transfers. Neither FP[L] nor Corp is shown to be a member of such a pool.

To the extent that the above wholesale rate decisions purport to rest on a theory of commingling, that theory is nowhere discussed in the context in which it is presented in this case. The term "commingled" appears to have originated in *Pennsylvania Water,* where it was used as a descriptive term for the Court's conclusion that some interstate power must have reached each wholesale customer. None of the subsequent power pool cases gives extended discussion to the scientific ramifications of the Commission's similarly conclusory findings that commingled energy reached each wholesale customer.

The consequences of the Commission's electromagnetic unity theory, with or without the additive of the commingling concept, as a basis for jurisdiction were described by the dissenters in this way:

> The vice I find in the Commission's decision, which prevents me from joining in its statement, is that its adoption of the commingling theory as a test for jurisdiction *per se,* interprets the Federal Power Act to have a reach beyond that which I find in the statute.
>
> The Federal Power Act is today found to grant to the Commission jurisdiction over *any*

company which generates electric energy in the form of alternating three-phase 60-cycle current, if that company is interconnected and electromagnetically synchronized with any other generating source producing electric energy in the same form in another State.

More than 90% of the Nation's electric generating capacity is interconnected in this fashion.[11] The only major exception is the electric generation of Texas, which is interconnected within Texas but not with out-of-Texas systems. Such a test for jurisdiction writes out of the statute the intrastate and industrial exceptions to coverage under the Act, and in doing so objectionably usurps a prerogative of the Congress.[12] (Emphasis in original.)

* * * * *

If commingling obviates tracing, then the reach of the Commission's jurisdiction is plenary. Furthermore, it has become plenary in 1967, while the act was passed in 1935 and has not been changed by Congress (in respects material here) since.

* * * * *

The stated purpose of section 202 was to assure an abundant supply of economical energy by *voluntary* interconnection of facilities. If jurisdiction inexorably follows interconnection, the nonjurisdictional utilities cannot retain any aspect of their independence once they agree

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[11] The examiner's description of scope was no less cogent.

"The electric systems of Florida and all other interconnected systems are essentially alike as to electrical, electromagnetic and electromechanical characteristics. Because they are alike, it is possible to have presently existing interconnected operations on a very large scale, extending from the Rocky Mountains to the Atlantic Ocean and from the Canadian to the Mexican border.

[12] The exceptions are set out in part 1 of this opinion.

> to interconnect. Impregnation is indivisible. Such a reading of section 202 is hardly conformable to its general spirit, and is inconsistent with the legislative history, of this part of the Act. (Emphasis in original.)

The qualities of electric energy have long been familiar. If the free flowing character of electricity *vel non* proved interstate transmission then connection, rather than proving nothing, *Jersey Central Power & Light Co. v. FPC, supra,* at 72, 87 L.Ed. 2d at 1269, proves everything, if it is made to any point of the synchronized system that spans most of this country.

The impact of these consequences is pointed up by two other factors: the principle that for determining existence of jurisdiction the quantity of energy transmitted interstate is immaterial,[13] and the implication by the majority of the Commission in the present case that they may be of the view that if the Commission has jurisdiction it cannot in the exercise of discretion decline to exercise it.

To attach federal agency jurisdiction is to supplant[14] or parallel[15] the regulatory schemes of the states. Congress avoided any such entry into the field where the Attleboro gap poses no bar to state regulation.

What the Commission virtually argues for in this case is extension of its jurisdiction to all electric companies affecting interstate commerce. Our society grows increasingly more complex, more dependent

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[13] Connecticut Light and Power Co. v. FPC, *supra;* Wisconsin-Michigan Power Co. v. FPC, 197 F.2d 472, 478 (7th Cir.) *cert. denied*, 345 U.S. 934, 97 L.Ed. 1362 (1953).

[14] *E.g.*, in wholesale ratemaking, 16 U.S.C. § 824d.

[15] *E.g.*, in accounting requirements, 16 U.S.C. § 825.

upon electric energy, and the interconnection of electric systems is ever more pervasive. But such an extension of Commission power, if determined to be in the national interest, is for the Congress and not for this court.

The petition for review is *granted* and the order of the Commission is *reversed.*

In the United States Court of Appeals for the Fifth Circuit

OCTOBER TERM, 1969

No. 24956

FLORIDA POWER & LIGHT COMPANY, PETITIONER,

v.

FEDERAL POWER COMMISSION, RESPONDENT

PETITION TO REVIEW AND SET ASIDE OPINION AND ORDERS OF THE FEDERAL POWER COMMISSION (FLORIDA CASE)

Before BELL, AINSWORTH and GODBOLD, *Circuit Judges.*

JUDGMENT

This cause came on to be heard on the petition of Florida Power & Light Company, for review of orders of the Federal Power Commission in Docket No. CA 13450, and was argued by counsel;

ON CONSIDERATION WHEREOF, It is now here ordered and adjudged that the petition for review is granted and that the orders of the Federal Power Commission in this cause be, and the same are hereby reversed.

JULY 13, 1970.

Issued as Mandate: Aug. 4, 1970.

Supreme Court of the United States

No. 958 ----- , *October Term, 19* 70

Federal Power Commission,

Petitioner,

v.

Florida Power & Light Company

ORDER ALLOWING CERTIORARI. Filed February 22, 1971.

The petition herein for a writ of certiorari to the United States Court of Appeals for the Fifth Circuit is granted.

Mr. Justice Blackmun took no part in the consideration or decision of this petition.

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No.

In the Supreme Court of the United States

OCTOBER TERM, 1970

FEDERAL POWER COMMISSION, PETITIONER

v.

FLORIDA POWER & LIGHT COMPANY

PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FIFTH CIRCUIT

ERWIN N. GRISWOLD,
Solicitor General,
SAMUEL HUNTINGTON,
Assistant to the Solicitor General,
Department of Justice,
Washington, D.C. 20530.

GORDON GOOCH,
General Counsel,
PETER H. SCHIFF,
Solicitor,
Federal Power Commission,
Washington, D.C. 20426.

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In the Supreme Court of the United States

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FEDERAL POWER COMMISSION, PETITIONER

v.

FLORIDA POWER & LIGHT COMPANY

PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FIFTH CIRCUIT

The Solicitor General, on behalf of the Federal Power Commission, petitions for a writ of certiorari to review the judgment of the United States Court of Appeals for the Fifth Circuit in this case.

OPINIONS BELOW

The opinion of the Court of Appeals (App. A, *infra,* pp. 13–33) is not yet reported. The opinions and orders of the Federal Power Commission (App. C, *infra,* pp. 37–62) are reported at 37 FPC 544 and 37 FPC 833. The opinion of the hearing examiner (App. D, *infra,* pp. 63–91) is reported at 37 FPC 560.

JURISDICTION

The judgment of the court of appeals (App. B, *infra,* p. 35) was entered on July 13, 1970. By order dated October 5, 1970, Mr. Justice Black extended the

time within which to file a petition for a writ of certiorari to November 10, 1970. The jurisdiction of this Court is invoked under 28 U.S.C. 1254(1) and Section 313(b) of the Federal Power Act (16 U.S.C. 825*l*(b)).

QUESTION PRESENTED

Whether the Federal Power Commission properly determined that the interconnection of an electric power utility with an interstate transmission grid involved "transmission of electric energy in interstate commerce" and thus made the utility subject to the Commission's regulatory jurisdiction.

STATUTE INVOLVED

Section 201 of the Federal Power Act, as added, 49 Stat. 847 (16 U.S.C. 824), provides in pertinent part:

SEC. 201

* * * * *

(b) The provisions of this Part shall apply to the transmission of electric energy in interstate commerce and to the sale of electric energy at wholesale in interstate commerce, but shall not apply to any other sale of electric energy or deprive a State or State commission of its lawful authority now exercised over the exportation of hydroelectric energy which is transmitted across a State line. The Commission shall have jurisdiction over all facilities for such transmission or sale of electric energy, but shall not have jurisdiction, except as specifically provided in this Part and the Part next following, over facilities used for the generation of electric energy or over facilities used in local distribution or only for the trans-

mission of electric energy in intrastate commerce, or over facilities for the transmission of electric energy consumed wholly by the transmitter.

(c) For the purpose of this Part, electric energy shall be held to be transmitted in interstate commerce if transmitted from a State and consumed at any point outside thereof; but only insofar as such transmission takes place within the United States.

* * * * *

(e) The term "public utility" when used in this Part or in the Part next following means any person who owns or operates facilities subject to the jurisdiction of the Commission under this Part.

STATEMENT

This case involves the Federal Power Commission's determination that the Florida Power & Light Company ("FPL") owns facilities for the transmission of electric energy in interstate commerce and thus is subject to the Commission's jurisdiction under Section 201 of the Federal Power Act, 16 U.S.C. 824. Although the only immediate impact of the determination would be to require FPL to follow the Commission's Uniform System of Accounts, the establishment of jurisdiction would empower the Commission, under appropriate circumstances, to direct FPL to interconnect with and sell power to other utilities or distributors, thereby improving the reliability of service to consumers, and would enable the Commission to regulate FPL's future sales of interstate

power at wholesale. The court of appeals reversed the order of the Commission, rejecting the methods adopted by the Commission for determining whether FPL transmits electricity in interstate commerce.

1. The facts developed before the Commission, in a proceeding initiated in 1965, can be summarized as follows: FPL is the largest electric utility in Florida and ranks ninth nationally in terms of revenues (App. C, *infra,* p. 39). Its extensive transmission, generation and distribution facilities, which provide power generally to the east coast of Florida, are all physically located within Florida and none of the facilities are used for the direct transmission of electricity across the state line. FPL is directly interconnected, however, with the Florida Power Corporation ("Corp") and three other Florida utilities which, together with FPL, form the Florida Pool; substantial amounts of electricity are exchanged among Pool members (App. C, *infra,* pp. 40-41). Corp, in turn, is directly interconnected across the state line with two subsidiaries of the Southern Company (a holding company of four major utilities operating in the South)—including the Georgia Power Company ("Georgia"). By contract, substantial amounts of electricity are exchanged on a seasonal basis between Corp and the subsidiaries of the Southern Company (App. C, *infra,* p. 41).

All of the power companies named above, including FPL, are among the 140 interconnected utilities making up the Interconnected Systems Group (hereinafter "ISG") spanning the southeastern and cen-

tral portions of the United States (App. C, *infra,* p. 42). FPL operates in synchronism with the other members of ISG and stands ready to assist them or to receive assistance in the event of emergency (App. D, *infra,* p. 69). The record discloses at least one instance during which FPL contributed power to help meet an emergency created by the loss of a mid-western generator (App. D, *infra,* p. 69).

In short, the record shows that FPL is a part of an interconnected, multi-state electric system; its operations in many respects are interdependent with the operations of the other members of ISG. To estabish jurisdiction over FPL, Section 201 of the Federal Power Act required the Commission to find that FPL had transmitted electric energy across the state line or had received energy from outside of Florida. 16 U.S.C. 824 (b) and (c). The evidence submitted to the Commission by its staff and FPL concentrated on whether there was a flow of energy between FPL and Georgia over the transmission lines of Corp.

In an effort to show that transmission had indeed taken place between FPL and Georgia, the staff presented extensive expert testimony on the physical characteristics of alternating current and its transmission tending to show that all elements of an electric network are physically interdependent, *i.e.,* that there is an "electromagnetic unity"; thus, for example, the addition of a load to one part of a network will instantaneously affect every generating unit in the system, all of which are synchronized (App. D, *infra,* p. 72). The staff alternatively utilized a

method of tracing power flows known as the "commingled method" for the purpose of showing that Georgia power reached FPL's lines (App. D, *infra,* p. 80). FPL, on its part, argued in favor of the "systems study" tracing method, which it claimed demonstrated that no power flowed between FPL and Georgia.[1] Both tracing methods were applied to data obtained from the commercial meters installed in the Corp and FPL systems.

2. After a comprehensive analysis of the interdependence and synchronization of power utilities forming an interconnected system (App. D, *infra,* pp. 70–79), the hearing examiner found that it was "the electromagnetic unity of response of [FPL], Corp, Georgia and other interconnecting systems that constitutes the interstate transmission of electric energy by [FPL]" (App. D, *infra,* pp. 78–79). In the alternative, however, he went on to consider the two tracing methods urged by the staff and FPL, noting at the outset that the nature of electric energy is not fully understood and that there is no physical way to trace the flow of electricity as one might trace the flow of a liquid through dyeing (App. D, *infra,* p. 79). He characterized the tracing methods advocated by the staff and FPL as attempts to "transpose the complex dynamism of modern alternating current electric sys-

[1] The two tracing methods are based on different assumptions as to what takes place within a "bus bar"—the physical device used to effect interconnections among two or more transmission lines. For a concise explanation of the bus bar and the assumptions underlying the two tracing theories, see the opinion of the hearing examiner, App. D, *infra,* pp. 80–82.

tems into simplified models on the basis of numerous assumptions" (App. D, *infra,* p. 80). With these limitations in mind, the examiner ruled that, if any tracing were necessary, the staff's commingled method best fit the realities of an alternating current power system. Accordingly, he found that the staff had established by tracing that power had been transmitted between FPL and Georgia (App. D, *infra,* pp. 82–83).

The Commission, in a 3–2 decision, accepted both of the alternative findings of the examiner, noting that the commingled tracing method had been used by it, with court approval, in numerous cases to establish that wholesale sales of power were in interstate commerce (App. C, *infra,* p. 46).

3. On review, the court of appeals reversed the Commission's order. It held that the electromagnetic unity theory was insufficient, standing alone, to prove that power flowing from Corp to Georgia, whether scheduled or non-scheduled, contained power generated by FPL or that power flowing from Corp to FPL contained power generated outside of Florida (App. A, *infra,* p. 23). As to the commingled tracing method, the court reiterated that the flow of electric energy was "not yet fully explainable" (App. A, *infra,* p. 24) and held that the "engineering and scientific fact test for interstate flow of energy is not met by postulating a simplified characterization of how, for various purposes of convenience, energy may be treated as flowing" (App. A, *infra,* pp. 26–27). It distinguished the prior court of appeals cases approving the commingled method for determining Commission

jurisdiction over sales at wholesale (see *infra,* pp. 9–10) on the ground that in each of those cases the utility had concededly received interstate power and the tracing method was only used to determine whether such power reached specific customers; it found this case distinguishable because it involved use of the method to trace interstate power to FPL itself, which denied receiving it (App. A, *infra,* p. 27–30).

REASONS FOR GRANTING THE WRIT

The issue presented by this case is of fundamental importance to the administration of the Federal Power Act. The decision below, which conflicts in principle with the decisions of three other courts of appeals, improperly rejected the Commission's alternative grounds for asserting jurisdiction over FPL, both of which were fully supported on the record by substantial evidence and expert testimony. By thus rejecting both the theory which fully takes into account the physics of modern interconnected electric systems (electromagnetic unity) and the tracing theory judged by the Commission to be the best approximation of the realities of electric power transmission, the decision leaves the Commission with no adequate basis for determining the scope of its own jurisdiction. Considerable uncertainty will undoubtedly prevail, with a likelihood of substantial further jurisdictional litigation, unless the issue is resolved by this Court. Such uncertainty would jeopardize the Commission's ability to regulate sales at wholesale of interstate power

and to order, under appropriate circumstances, interconnections between utilities.

1. The court below recognized (App. A, *infra*, p. 16) that whether electric energy moves "in interstate commerce" within the meaning of Section 201 of the Federal Power Act[2] is a question of "engineering and scientific" fact. See *Connecticut Light & Power Co.* v. *Federal Power Commission*, 324 U.S. 515, 529; *Federal Power Commission* v. *Southern California Edison Co.*, 376 U.S. 205, 209, n. 5. It rejected, however, the Commission's expert opinion that the electromagnetic unity theory best takes into account such facts. The court's rejection of this theory and of the commingled method of tracing power as an oversimplification is inconsistent with the positions taken by three other courts of appeals.[3] See *Public Service Co. of Indiana, Inc.* v. *Federal Power Commission*, 375 F. 2d 100 (C.A. 7), certiorari denied, 387 U.S. 931; *Cincinnati Gas & Electric Co.* v. *Federal Power Commis-*

[2] Section 201 was added to the Federal Power Act in 1935, 49 Stat. 847, to bring interstate sales of electricity under federal regulation following this Court's decision in *Public Utilities Commission v. Attleboro Steam & Electric Co.*, 273 U.S. 83, holding that such sales were beyond the reach of state regulatory authorities. The interstate transmission involved in *Attleboro* was a direct transmission between two utilities located in different states.

[3] Until the decision below created this conflict, acceptance of the commingled tracing method by the other courts of appeals indicated that the extensive jurisdictional litigation which had consumed much of the Commission's energies had come to an end and that therefore the Commission would be able to devote its full resources to the performance of its substantive obligations under the Federal Power Act.

sion, 376 F. 2d 506 (C.A. 6), certiorari denied, 389 U.S. 842; *Indiana & Michigan Electric Co.* v. *Federal Power Commission,* 365 F. 2d 180 (C.A. 7), certiorari denied, 385 U.S. 972; *Arkansas Power & Light Co.* v. *Federal Power Commission,* 368 F. 2d 376 (C.A. 8). Three of these cases approved the Commission's reliance upon the commingled method to trace power from an admittedly interstate interconnection to specific sales at wholesale. The distinguishing of those cases on the ground that a method which is a satisfactory representation of reality for some jurisdictional purposes is not satisfactory for other jurisdictional purposes is, we submit, untenable.

2. The decision below would leave the Commission with no acceptable means for determining the scope of its own jurisdiction.[4] The jurisdictional status of a utility, however, is a matter of considerable importance to all concerned (although the only immediate effect of the Commission's order in this case would be to require FPL to follow the Commission's Uniform System of Accounts thereby subjecting FPL's operations to Commission and public scrutiny on the same basis as the operations of other utilities). If a utility is subject to the Commission's jurisdiction, its wholesale rates for interstate power sales are subject to regulation by the Commission, and the utility may not grant undue preference to its whole-

[4] The decision below did not approve of FPL's "systems study" tracing method, which, as the Commission held (see, *infra,* p. 7), was inferior to the commingled tracing method in approximating the realities of electric energy transmission. FPL's method is, thus, a fortiori unacceptable on the principles of the opinion of the court of appeals.

sale customers as a class or discriminate between them individually. Of equal importance, in view of the public need for reliability in the supply of electricity, is the Commission's authority to order utilities subject to its jurisdiction, under certain circumstances and under appropriate terms, to interconnect with other utilities so as to improve reliability of service and result in economies for both parties to the interconnection. See *Florida Power Corporation* v. *Federal Power Commission,* 425 F. 2d 1196 (C.A. 5), certiorari granted, October 26, 1970, No. 469, this Term.

3. In substance, the court of appeals has held that the Federal Power Commission cannot regulate electric power utilities on the basis of their interstate interconnections unless it can prove with scientific certainty that electric energy physically moves across a state line. It has thus put on the Commission a burden that is impossible to meet in the present state of technical knowledge, and is content to say that unless and until technical knowledge advances to a state that permits certainty the Commission cannot assert jurisdiction. This is not a satisfactory posture in which to leave this important question. By definition, the Commission either does or does not have jurisdiction, and whether it does depends upon whether there is interstate transmission in the general sense in which that term was used in the context of interstate commerce. We acknowledge that the Commission has the burden of establishing the existence of the jurisdictional premise, but urge that it has done so when it has determined, on the basis of substantial evidence, that the premise exists in the light

of the best current expert opinion. As in other regulatory areas, decision cannot be avoided on the ground that no decision can have absolute certainty; indeed, it is the impossibility of such absolute certainty that necessitates resort to the expert judgment of an administrative agency.

Moreover, the decision below ignores the economic realities of an interconnection situation such as FPL's. What we are dealing with here is the meaning of the phrase "transmission of electric energy" which Congress has used in stating the scope of its exercise of the power to regulate "commerce" among the several states. Whether some identifiable *thing* moves or not, it is clear that this interstate interconnection has both physical and economic effects which transcend state lines. Those effects are within the concept of the "commerce" that Congress can regulate and within the proper construction of the standard established by Congress to define the area it wishes to regulate.

CONCLUSION

For the foregoing reasons, the petition for a writ of certiorari should be granted.

Respectfully submitted.

ERWIN N. GRISWOLD,
Solicitor General.

SAMUEL HUNTINGTON,
Assistant to the Solicitor General.

GORDON GOOCH,
General Counsel,

PETER H. SCHIFF,
Solicitor,
Federal Power Commission.

NOVEMBER 1970.

APPENDIX A

In the United States Court of Appeals for the Fifth Circuit

No. 24956

FLORIDA POWER & LIGHT COMPANY, PETITIONER

v.

FEDERAL POWER COMMISSION, RESPONDENT.

PETITION TO REVIEW AND SET ASIDE OPINION AND ORDERS OF THE FEDERAL POWER COMMISSION (FLORIDA CASE)

(July 13, 1970)

Before BELL, AINSWORTH and GODBOLD, *Circuit Judges.*

GODBOLD, *Circuit Judge:* Florida Power & Light Company (FPL) petitions for review of a determination,[1] reached by the Federal Power Commission on a 3–2 vote, that it is a public utility within the meaning of § 201 of the Federal Power Act, 16 U.S.C. § 824(e). We reverse the Commission and set aside its order.

The term "public utility" means "any person who owns or operates facilities subject to the jurisdiction of the Commission under sections 824–824h of this

[1] 37 F.P.C. 544.

title." 16 U.S.C. § 824(e). "The provisions of sections 824–824h of this title shall apply to the transmission of electric energy in interstate commerce and to the sale of electric energy at wholesale in interstate commerce * * * The Commission shall have jurisdiction over all facilities for such transmission or sale of electric energy." 16 U.S.C. § 824(b).

The Commission asserts jurisdiction on the ground that FPL owns and operates facilities for the transmission of electric energy in interstate commerce. Jurisdiction over interstate wholesale sales under § 824(b) is not involved.

1. BACKGROUND

FPL's facilities are located wholly within the State of Florida. It has no connections at the state line with any out of state system. Commission jurisdiction is predicated on transmission interstate of FPL-generated power through its interconnection with other electric systems outside of and within Florida, and receipt by FPL, through these interconnections, of power generated outside of Florida.

Congress exercised its power under the Commerce Clause and undertook federal regulation in the interstate electric field as a result of the decision of the Supreme Court in *Public Utilities Commission of Rhode Island v. Attleboro Steam & Electric Co.*, 273 U.S. 83, 71 L.Ed. 549 (1927), holding that neither Massachusetts nor Rhode Island had power to regulate the sale by a Rhode Island utility of electric energy to a Massachusetts utility because the sale was in interstate commerce. There being at that time no federal regulation of interstate sales by electric utilities, Congress acted to close this gap in effective

utility regulation, the "Attleboro gap," by enacting Part II of the Federal Power Act in 1935.

Jurisdiction of the FPC is not based upon a test of effect on interstate commerce but upon interstate transmission of electric energy (or wholesale sales in interstate commerce, not here applicable). 16 U.S.C. § 824(b). To make clear that Commission jurisdiction extends only to transmission or sales "in interstate commerce," the Congress wrote several specific exclusions into the Act.

> * * * such Federal regulation, however, to extend only to those matters which are not subject to regulation by the States.

16 U.S.C. § 824(a). This caveat and the directive that the Act.

> shall not apply to any other sale of electric energy or deprive a State or State commission of its lawful authority now exercised over the exportation of hydro-electric energy which is transmitted across a State line * * *,

16 U.S.C. § 824(b), extend Commission jurisdiction to the limits of but no further than the Attleboro gap. *Connecticut Light & Power Co.* v. *FPC*, 324 U.S. 515 89 L.Ed. 1150 (1945); *Jersey Central Power & Light Co. v. FPC*, 319 U.S. 61, 87 L.Ed. 1258 (1943).

> Likewise, the Commission shall not have jurisdiction, except as specifically provided * * * over facilities used for the generation of electric energy or over facilities used in local distribution or only for the transmission of electric energy in intrastate commerce, or over facilities for the transmission of electric energy consumed wholly by the transmitter.

16 U.S.C. § 824(b). Exemptions are also provided for governmental units and corporations, 16 U.S.C. § 824

(f), for one engaged in transmission or sale of electric energy but not otherwise subject to the Act who makes a temporary emergency connection with a public utility subject to the jurisdiction of the Commission, 16 U.S.C. § 824a(d), and for certain international exports, 16 U.S.C. § 824a(f).

Congress defined interstate transmission as follows:

> [E]lectric energy shall be held to be transmitted in interstate commerce if transmitted from a State and consumed at any point outside thereof.

16 U.S.C. § 824(c). The Supreme Court has credited the Congress with determining that "federal jurisdiction was to follow the flow of electric energy, an engineering and scientific rather than a legalistic or governmental test." *Connecticut Light & Power Co. v. FPC, supra.* Commission power does not extend over all connecting transmission facilities but only those which transmit energy actually moving in interstate commerce. Mere connection determines nothing. *Jersey Central Power & Light Co. v. FPC,* supra, at 72, 87 L.Ed. at 1269.

The concept of following the flow of electric energy from one state to the other was easy to apply in *Attleboro.* A Rhode Island electric company delivered energy over its Rhode Island transmission lines to the facilities of a Massachusetts electric company which had no generating capacity. Now generating companies are interconnected with each other nationwide. Companies have formed area and regional power pools, with varying degrees of integration and centralized management. The Commission itself has power to establish regional districts for voluntary interconnection and coordination of facilities and to promote such interconnection and coordination. 16 U.S.C. § 824a(a).

Interconnection has become a fact of life to meet needs, scheduled and emergency, of localized areas and large regions.[2]

2. THE INSTANT CASE

FPL produces and sells electric energy in eastern and southern Florida. But it is a major electric company.[3]

The Commission opinion describes FPL's interconnections:

> FPL is directly interconnected with four other Florida electric systems, as follows: Florida Power Corporation (Corp), Tampa Electric Company (Tampa), Orlando Utilities Commission (Orlando), and the City of Jacksonville (Jacksonville). FPL, Corp, and Tampa form the Florida Operating Committee (Florida Pool) with Jacksonville and Orlando as associate members. The Florida Pool meets several times a year to consider mutual problems relating to the interconnected operation of the systems, including the coordination of spinning reserves, the arrangement of compatible plant maintenance schedules, and the coordination of plans for the construction of transmission lines and the staggered construction of generating units.
>
> * * * * *

[2] The examiner noted the Northeast power failure of 1965, which plunged large sections of the eastern United States into darkness.

[3] In 1965 it served nearly one million customers, ranked ninth nationally among electric companies in revenues, fourteenth in investment in gross electric utility plant, and sixteenth in kilowatt hour sales. Six of its customers are electric cooperatives, and it occasionally sells to municipal electric systems on an emergency basis. Because of the frequent threat of hurricanes severing its transmission lines, FPL attempts to be self-sufficient, even within different segments of its system.

Corp, which is interconnected with Tampa and Orlando as well as with FPL, is also interconnected with power companies outside of the State of Florida. Thus, it is directly interconnected with Georgia Power Company (Georgia), a subsidiary of The Southern Company (Southern). Southern is a holding company whose other subsidiaries are Gulf Power Company (Gulf) which operates in northwestern Florida, Alabama Power Company (Alabama), and Mississippi Power Company (Mississippi). Corp is also directly interconnected with Gulf, and Gulf is interconnected with Georgia and Alabama. Corp has an agreement with the subsidiaries of Southern whereby Corp makes 100,000 kw available to these subsidiaries during the summer, and in return, the subsidiaries make 100,000 kw available to Corp during the winter. During 1964 Southern delivered 167,476,000 kwh to Corp, and Corp delivered 157,324,000 kwh to Southern. Of these totals, approximately 97,000,000 kwh represented deliveries from Georgia to Corp, and 82,000,000 kwh represented deliveries from Corp to Georgia. In addition, 3.9 million kwh were wheeled for the Southwestern Power Administration over Southern's lines across the Georgia-Florida state line to Corp. Georgia is also interconnected with Duke Power Company, Tennessee Valley Authority, and Southeastern Power Administration. These systems operate in states beyond Georgia.

FPL and the other members of the Florida Pool are also members of a multi-state electric network, the Southeast Region of the Interconnected Systems Group (ISG) which covers the southeastern and central portions of the United States. FPL's membership in the ISG provides acceptable frequency control and also automatic assistance during emergencies in the event of any generation outage of less than

100 mw on its system. In this connection it may be noted that 12 of FPL's 24 generating units generate 75 mw or less. An outage of any of these units would lead to almost instantaneous assistance to FPL. FPL, in turn, operates in synchronism with the 140 members of ISG and is ready to assist them in case of emergency. Thus, FPL contributed 8 mw to ISG to assist a midwestern utility which had sustained a 580-mw generator loss.

The Commission position is best explained by quoting from its opinion:

> The testimony and evidence of record support the examiner's findings that the electric power on all the interconnected systems in which FPL, Corp, and Georgia participate is supplied as alternating current at a frequency of 60 cycles; that the frequency of each system is in synchronism with that of all the others in the interconnection; that there is a tie-line bias with frequency control on the interconnected systems which permits a free flow of power and energy throughout the networks in which FPL, Corp, and Georgia participate; that all 140 members of the ISG operate in parallel and are interlocked electromagnetically; and that FPL can receive from or contribute to ISG up to 100 mw. The record further supports the examiner's findings that FPL normally has no control over the actual transfers of electric power and energy with any particular electric system with which it is interconnected; that since electric energy can be delivered virtually instantaneously when needed on a system at a speed of 186,000 miles per second, such energy can be and is transmitted to FPL when needed from out-of-state generators, and in turn can be and is transmitted from FPL to help meet out-of-state demands; and finally, that there is a cause and effect relationship in electric

> energy occurring throughout every generator and point on the FPL, Corp, Georgia, and Southern systems which constitutes interstate transmission of electric energy by, to, and from FPL.
>
> In its exceptions FPL argues that there is no substantial record support for the examiner's finding that it is engaged in the transmission of electric energy in interstate commerce. We find no merit in this argument. The examiner concluded that the operation in FPL in electromagnetic unity with the suppliers in and outside of Florida in and of itself demonstrated that it owned and operated facilities for the interstate transmission of electric energy. This finding is also supported by the evidence produced by staff at the hearing which convincingly establishes that electric energy is transmitted in interstate commerce to and from FPL's lines.

The Commission adopted the examiner's findings. Two are basic. First, that ownership and operation of facilities for interstate transmission was proved by reason of FPL's interconnection with other systems inside and outside of Florida "in electromagnetic unity of response," without any necessity of tracing the path of any interstate electrical energy. Second, that if tracing was considered essential, there had been interstate transmission to and from FPL's lines, based on the Commission's staff studies, which were predicated upon the "commingling theory" of the transmission of electric energy. It is not clear to us whether the examiner and the majority of the Commission considered commingling as undergirding the electromagnetic unity of response theory or as irrelevant to it. The dissenters appeared to treat the two concepts as one, pursuant to which at all times an interconnected network is "permeated" with free flowing electric energy.

The nature and effects of the concept of "electromagnetic unity of response" were described by the examiner approximately as follows. The interconnected systems supply alternating current on the same frequency, 60 cycles per second, with the frequency of each system in synchronism with that of all other systems in the interconnection. The speed of all generators on the interconnected systems is irrevocably locked to the same frequency. A response mechanism known as tie line bias control regulates output in individual systems so that total overall generation matches as closely as possible the total overall load. When at any point a change in load occurs or a generator is taken out of service, this will affect every point on the interconnected systems. For example, every connected generator on the interconnected systems will contribute energy to compensate for any additional load to maintain the balance between total overall generation and total overall load and thereby maintain frequency at 60 cycles. The immediate effects of load or generation changes are dispersed throughout the electromagnetically interlocked generators of the interconnected systems. The magnitude of change in instantaneous generation and frequency will tend to diminish as the distance from the point of load or generation change increases. As such changes occur tie line bias control operates to restore the net interchange of power between each system and its neighbors to the former prearranged level.[4]

[4] The automatic, nonscheduled transfers effected by tie line bias control are not the sole or even the most important transfers among systems. For a variety of reasons, electric companies agree to swap power. Scheduled transfers include seasonal sales, like those between Southern and Corp; other economy sales, made profitable by differences in marginal efficiency among production plants, Indiana and Michigan Electric Co. v. FPC, 365

In our example above, the particular system on which total load increased will automatically increase its own generation to supply the additional load, and the other systems correspondingly will reduce their temporarily increased electric generation. No attempt is made to control flows of electric energy in individual lines (in fact, electric systems normally have no control over actual transfers of energy between them, if there is more than one interconnection), because the flows are determined by the electric characteristics of the overall network. Only the net of flows is controlled, by increasing or decreasing generation so as to maintain scheduled transmissions of power (both within a system and between systems). Thus there is free flow of electric energy throughout the overall network but limited by control of the net of flows, frequency changes, tie line bias, and the responses of generators to load changes.

The examiner stated that nobody can say for certain just how electricity is really transmitted, but that "the answer is not important for legal purposes." He found:

> The cause and effect relationship in electric energy occurring throughout every generator and point on the Georgia, Corp and Florida systems constitutes interstate transmission of electric energy by, to, and from Florida. It is the electromagnetic unity of response of Florida, Corp, Georgia and other interconnecting systems that constitutes the interstate transmission of electric energy by Florida.

F.2d 180 (7th Cir.), *cert. denied*, 385 U.S. 972, 17 L.Ed. 2d 435 (1966); and transfers to compensate for temporary needs such as plant maintenance, as in the Florida Operating Committee arrangements.

We conclude that the complex relationship of cause and effect in interconnected and synchronized systems is, as to FPL, not sufficient to prove the actual transmission of energy interstate. It tells us what, as to that company, could occur. It does not tell us with any substantial degree of certainty what does occur.

This is not to say that "electromagnetic unity of response," with the reasonable inferences which may be drawn therefrom, may not be a part of substantial evidence of interstate transmission, as in the "power pool" cases discussed below. But, standing alone, as to FPL it is not substantial evidence establishing that when energy flows from Corp's lines to Georgia's lines, either scheduled or in response to frequency drop in the state of Georgia or somewhere further distant, the Florida power transmitted is Corp's plus FPL's and not Corp's alone, and conversely that when energy flows from Corp to FPL it is not Corp's alone but mixed with power generated outside Florida.[5] The Commission referred, at the end of the excerpt first above quoted, to FPL's contribution of 8 mw to ISG during an outage in the midwest. That "contribution" does not necessarily mean that power was transmitted interstate from FPL to the midwest. Although the effect of FPL's transmission was to increase the total wattage available to the whole system,

[5] We have focused, as did the examiner and the Commission, on interstate transmission in terms of FPL's interconnection with Corp. But the theory of interconnection and synchronization is applicable to the outermost ends of all interconnected systems. Thus, under this theory a direct interconnection of FPL with Corp is unnecessary because, for example, FPL interconnects with Tampa and Orlando in the Florida Pool, and those two companies are interconnected with Corp, which interconnects to Gulf, which interconnects to Alabama.

the "electromagnetic unity of response" theory is equally compatible with either the Commission's "permeation" assumption or the hypothesis that the power transmitted by FPL was consumed by Corp, another eight mw being passed on by Corp for further use or transmission.

Turning to the second basic finding of energy actually traced, the supporting evidence of actual transmissions referred to by the Commission consists of staff studies purporting to trace energy from Georgia through Corp's substation in Florida into FPL's system, and at other times over the same lines from FPL to Corp to Georgia. These studies are predicated upon the commingling theory, which is simply a method of conceptualizing the complex and not yet fully explainable flow of electric energy. FPL asserted the validity of a different theory, the "systems study method."[6] The difference between this method and the commingling method relied on by the Commission lies in their assumptions about the nature of the transmission bus, a collection and transmission facility for electric power, for example, a substation. The systems study method assumes that it is possible to measure the magnitude and direction of flows within a bus as well as along transmission lines between buses. Relying on this assumption, FPL introduced measurements tending to show that for each point in time at which the Commission attempted to trace power from Georgia to FPL there was in fact a reversal in flow through the bus away from FPL's connection either on the Corp-FPL bus or on some other bus earlier in the trace through Corp's system. Finding on each bus

[6] This is a variation of the so-called steady state method used for accounting and planning purposes in the electric power industry.

the connection which brought power from the direction of Georgia, and totaling the inputs and outflows through other connections on the bus in the direction of FPL's connection, FPL calculated that inputs over this part of the bus were greater than outflows. Under the systems study assumptions, then, power could only flow in the opposite direction through the bus, away from FPL's connection.

The staff did not disprove the correctness *vel non* of these measurements by FPL.[7] Instead the staff urged that the steady state method of describing the flow of three-phase power is inadequate and that the flow is best conceptualized by the commingling theory.

Modern electric utilities generate alternating current electricity. The steady state method treats the flows and counterflows of alternating current as unidirectional and measures only the net of the flows and counterflows. This simply ignores that alternating current is not unidirectional.[8] The commingling concept too treats power flows as only net quantities. But the bus is treated as a "tank" or a "reservoir." The energy flowing to each load on the bus is attributed to each source of energy in the proportion that the source contributes to the total energy flowing into the bus. If at any instant the net flow of power is toward a system—that is, its load is more than its generation—it is assumed that at that moment some portion of the

[7] Counsel for the Commission attempted to do so by a chart, first presented on appeal, which purported to show by the steady state method that interstate power reached FPL. The petitioner did not have a chance to question or controvert in a factual hearing assumptions underlying this chart, so we may not consider it on this appeal.

[8] Staff experts testified that the deficiencies of the steady state method could be corrected by measuring counterflows of energy.

power being consumed by that system flowed into it from every other system contributing to the "tank" or "reservoir" at the bus.[9] Neither the examiner nor the Commission treated the commingling theory as a scientific fact depicting accurately what does occur but only as the more adequate way to conceptualize actual occurrences.[10]

The Commission expert witness Jacobsen acknowledged commingling has never been verified experimentally as fact. The following interchange took place during the hearing before the examiner:

> PRESIDING EXAMINER. I take it the theories are not necessarily right or wrong. How does your theory better explain the facts?
>
> THE WITNESS. [Commission expert]: I think that would be a better question.

In some contexts the commingling method may be a more useful tool for analysis than steady state methods, but this is not to say that it is adequate for all purposes. Both suffer from the same vice of creating a construct which departs from the actual manner in which electricity operates and then attempting to trace the consequences. The engineering and scientific fact test for interstate flow of energy is not met by postu-

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[9] Although we do not rest our decision on this testimony, we note that an expert for FPL calculated that, if it be conceded that commingled power flowed from Georgia to FPL under the Commission's assumptions, the interstate component of the power flowing from Corp into the FPL substation at Sanford, Florida would be only 0.07%, and that as a portion of the energy then being delivered by FPL to its consumers, this interstate energy would amount to only 0.00015%.

[10] Thus the examiner stated:

> "[S]everal explanations may be sufficient [to account for the amount of electric energy at any one point] but none may possess the uniqueness necessary for proof."

lating a simplified characterization of how, for various purposes of convenience, energy may be treated as flowing.

3.

The "engineering and scientific" test based on actual power flow was articulated in *Connecticut Light & Power*. In that case, in the next following words the Supreme Court said:

> Technology of the business is such that if any part of a supply of electric energy comes from outside of a state it is, or may be, present in every connected distribution facility.

324 U.S. at 529, 89 L.Ed. at 1160. We do not construe this language as obviating the necessity for showing interstate transmission of power. In context the Supreme Court was discussing not the technological transmission test but the exception from FPC jurisdiction of "facilities used in local distribution." 16 U.S.C. § 824.

The Commission bears the burden of proving its asserted jurisdiction. *Public Service Co. of Indiana v. FPC,* 375 F.2d 100, 104 (7th Cir.), *cert. denied,* 387 U.S. 931, 18 L.Ed. 2d 992 (1967); *Arkansas Power & Light Co. v. FPC,* 368 F.2d 376 (8th Cir. 1966). In attempting to meet this burden, the Commission does not rely upon the two "straight status" cases that have been adjudicated by the Supreme Court, *Connecticut Light and Power* and *Jersey Central,* neither of which supports its approach in this instance. Instead it turns to the cases in which jurisdiction has been found over wholesale sales "in interstate commerce" and adapts their methodology. *Cincinnati Gas & Elec. Co. v. FPC,* 376 F.2d 506 (6th Cir.), *cert. denied,* 389 U.S. 842, 19 L.Ed. 2d 106 (1967); *Public Serv-*

ice Co. of Indiana v. FPC, supra; Arkansas Power & Light Co. v. FPC, supra; Indiana and Michigan Electric Co. v. FPC, 365 F.2d 180 (7th Cir.), *cert. denied,* 385 U.S. 972, 17 L.Ed. 2d 435 (1966); see also *Pennsylvania Water & Power Co. v. FPC,* 343 U.S. 414, 96 L.Ed. 1042 (1952). *Pennsylvania Water* concerned wholesale sales of an admitted public utility, as defined by the Act, which was part of a system integrated with a Maryland company. During periods of low flow on the Susquehanna River it received substantial amounts of power from the Maryland company, and it was not contested that some interstate energy reached each of its customers.

Each of the four companies in the "power pool" cases from the Sixth, Seventh and Eighth Circuits was likewise a public utility within the meaning of the Act. Each of them also participated in an integrated power pool centrally directed to maximize efficiency by economy transfers and to provide emergency power. CG&E, PSCI and I&M were all members of the American Electric Power System (AEP) spanning several midwestern states, and Arkansas Power & Light was a member of a similar pool operation including utilities in three southern states.

Each of these cases rests on far more than interconnection plus electromagnetic unity of response plus commingling. In both *CG&E* and *Arkansas Power & Light,* limited samples showed that some of the petitioners' wholesale customers received out of state energy. In each case, the company's principal contention was that tracing was necessary to establish the presence of out of state energy in its wholesale transmissions to its remaining customers as well. In each case the utility's membership in a pool, and its consequent regular purchases for economy and other rea-

sons of power generated in other states, justified an inference that not just some but all of its wholesale sales contained interstate energy.

In *I&M* and *PSCI*, the Commission traced no interstate energy to any wholesale customer. In *I&M*, this may have been unnecessary, since there was evidence that for substantial periods of time Illinois energy supplied at least large portions of north central Indiana and southwest Michigan, thereby bringing this case close to *CG&E* and *Arkansas Power & Light*, *PSCI* is the most far-reaching case. But the court in that case rested squarely on *I&M*, finding that the company's participation in the integrated AEP network, in view of the impossibility of tracing, justified the inference that some of the interstate power which demonstrably flowed in PSCI's lines reached each of its wholesale customers.

We agree with the court in *Arkansas Power & Light, supra*, at 383, n.8, that establishing wholesale rate jurisdiction over an electric company which is a public utility within the Act is a different matter from establishing plenary jurisdiction over a company based on interstate transmission. A consideration in the wholesale sale case is the seeming irrationality of allowing Commission jurisdiction over wholesale sales to which experts can trace some out of state energy, but not over those to which it might be impossible to trace interstate power, when it is obvious that there is interstate power in substantial portions of the utility's system. *Cf Arkansas Power & Light, supra*. Another consideration is the seeming irrationality of a public utility with interstate electric energy flowing in its system escaping FPC jurisdiction over wholesale sales because of impossibility of proof arising from the inadequacy of instruments used by the utility itself. *Cf. Indiana & Michigan, supra*. These con-

siderations have little application to the problems of federalism and reservations of power to the states imposed by the instant case, where the issue is one of whether FPL is a public utility at all, measured under tests articulated by the Congress and the courts in terms of actual transmissions of interstate energy.

Some of the wholesale rate cases have relied heavily on the respective companies' participation in an integrated interstate power pool, which provided power more or less continuously, in substantial amounts, and with economy transfers. Neither FP[L] nor Corp is shown to be a member of such a pool.

To the extent that the above wholesale rate decisions purport to rest on a theory of commingling, that theory is nowhere discussed in the context in which it is presented in this case. The term "commingled" appears to have originated in *Pennsylvania Water,* where it was used as a descriptive term for the Court's conclusion that some interstate power must have reached each wholesale customer. None of the subsequent power pool cases gives extended discussion to the scientific ramifications of the Commission's similarly conclusory findings that commingled energy reached each wholesale customer.

The consequences of the Commission's electromagnetic unity theory, with or without the additive of the commingling concept, as a basis for jurisdiction were described by the dissenters in this way:

> The vice I find in the Commission's decision, which prevents me from joining in its statement, is that its adoption of the commingling theory as a test for jurisdiction *per se,* interprets the Federal Power Act to have a reach beyond that which I find in the statute.
>
> The Federal Power Act is today found to grant to the Commission jurisdiction over *any*

company which generates electric energy in the form of alternating three-phase 60-cycle current, if that company is interconnected and electromagnetically synchronized with any other generating source producing electric energy in the same form in another State.

More than 90% of the Nation's electric generating capacity is interconnected in this fashion.[11] The only major exception is the electric generation of Texas, which is interconnected within Texas but not with out-of-Texas systems. Such a test for jurisdiction writes out of the statute the intrastate and industrial exceptions to coverage under the Act, and in doing so objectionably usurps a prerogative of the Congress.[12] (Emphasis in original.)

* * * * *

If commingling obviates tracing, then the reach of the Commission's jurisdiction is plenary. Furthermore, it has become plenary in 1967, while the act was passed in 1935 and has not been changed by Congress (in respects material here) since.

* * * * *

The stated purpose of section 202 was to assure an abundant supply of economical energy by *voluntary* interconnection of facilities. If jurisdiction inexorably follows interconnection, the nonjurisdictional utilities cannot retain any aspect of their independence once they agree

[11] The examiner's description of scope was no less cogent.

"The electric systems of Florida and all other interconnected systems are essentially alike as to electrical, electromagnetic and electromechanical characteristics. Because they are alike, it is possible to have presently existing interconnected operations on a very large scale, extending from the Rocky Mountains to the Atlantic Ocean and from the Canadian to the Mexican border.

[12] The exceptions are set out in part 1 of this opinion.

> to interconnect. Impregnation is indivisible. Such a reading of section 202 is hardly conformable to its general spirit, and is inconsistent with the legislative history, of this part of the Act. (Emphasis in original.)

The qualities of electric energy have long been familiar. If the free flowing character of electricity *vel non* proved interstate transmission then connection, rather than proving nothing, *Jersey Central Power & Light Co. v. FPC, supra,* at 72, 87 L.Ed. 2d at 1269, proves everything, if it is made to any point of the synchronized system that spans most of this country.

The impact of these consequences is pointed up by two other factors: the principle that for determining existence of jurisdiction the quantity of energy transmitted interstate is immaterial,[13] and the implication by the majority of the Commission in the present case that they may be of the view that if the Commission has jurisdiction it cannot in the exercise of discretion decline to exercise it.

To attach federal agency jurisdiction is to supplant[14] or parallel[15] the regulatory schemes of the states. Congress avoided any such entry into the field where the Attleboro gap poses no bar to state regulation.

What the Commission virtually argues for in this case is extension of its jurisdiction to all electric companies affecting interstate commerce. Our society grows increasingly more complex, more dependent

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[13] Connecticut Light and Power Co. v. FPC, *supra;* Wisconsin-Michigan Power Co. v. FPC, 197 F.2d 472, 478 (7th Cir.) *cert. denied*, 345 U.S. 934, 97 L.Ed. 1362 (1953).

[14] *E.g.*, in wholesale ratemaking, 16 U.S.C. § 824d.

[15] *E.g.*, in accounting requirements, 16 U.S.C. § 825.

upon electric energy, and the interconnection of electric systems is ever more pervasive. But such an extension of Commission power, if determined to be in the national interest, is for the Congress and not for this court.

The petition for review is *granted* and the order of the Commission is *reversed.*

APPENDIX B

In the United States Court of Appeals for the Fifth Circuit

OCTOBER TERM, 1969

No. 24956

FLORIDA POWER & LIGHT COMPANY, PETITIONER,

v.

FEDERAL POWER COMMISSION, RESPONDENT

PETITION TO REVIEW AND SET ASIDE OPINION AND ORDERS OF THE FEDERAL POWER COMMISSION (FLORIDA CASE)

Before BELL, AINSWORTH and GODBOLD, *Circuit Judges.*

JUDGMENT

This cause came on to be heard on the petition of Florida Power & Light Company, for review of orders of the Federal Power Commission in Docket No. CA 13450, and was argued by counsel;

ON CONSIDERATION WHEREOF, It is now here ordered and adjudged that the petition for review is granted and that the orders of the Federal Power Commission in this cause be, and the same are hereby reversed.

JULY 13, 1970.

Issued as Mandate: Aug. 4, 1970.

APPENDIX C

(Opinion No. 517)

FLORIDA POWER & LIGHT COMPANY, DOCKET NO. E-7210

OPINION AND ORDER DETERMINING JURISDICTION

(Issued March 20, 1967)

Before Commissioners: Lee C. White, Chairman; L. J. O'Connor, Jr., Charles R. Ross, Carl E. Bagge and John A. Carver, Jr.

WHITE, *Chairman:*

This is a proceeding to determine whether the Florida Power & Light Company (FPL) is a public utility within the meaning of Section 201 of the Federal Power Act, and whether it should be required to maintain its accounts in accordance with the Commission's Uniform System of Accounts for Public Utilities and Licensees.

The Commission instituted the investigation in this docket on February 26, 1965, 33 FPC 328. The Florida Public Service Commission (Florida Commission) filed notice of intervention dated March 17, 1965, and thereafter the City of Clewiston, Florida (Clewiston), was granted limited intervention.[1] Hearings were held

[1] On September 7, 1965, Clewiston filed a complaint in Docket No. E-7243, requesting that the Commission order FPL, pursuant to Section 202(b) of the Act, to connect its facilities with those of Clewiston and render direct wholesale service at rea-

on October 4, 5, 7, 8, and 12, 1965, and again on November 3, 1965. On July 12, 1966, the Presiding Examiner Seymour Wenner, issued an initial decision in which he found that FPL owns and operates facilities, among others, for the transmission of electric energy transmitted from points of generation in the States of Georgia and Florida to points of consumption outside the state in which it is generated, and therefore is a public utility under Section 201 of the Act, subject to the Commission's jurisdiction.

He further held that FPL must file original cost statements as provided in the Commission's Uniform System of Accounts Prescribed for Public Utilities and Licensees Subject to the Provisions of the Federal Power Act, and that it must comply with all other requirements of the Commission's Regulations under such Act.

The proceeding is before the Commission on the examiner's decision, exceptions filed by FPL and the Florida Commission, and staff's opposition to these exceptions. FPL and the Florida Commission contend that there is no substantial evidence in the record to support the examiner's finding that FPL transmits electric energy in interstate commerce, and they urge that the Commission, in the exercise of its discretion, should in any event decline jurisdiction over FPL. Oral argument was held before the Commission on November 28, 1966.

For the reasons set forth below we find that FPL's and the Florida Commission's exceptions are not persuasive and do not warrant our reversal of the exam-

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sonable rates. After the hearings, Clewiston negotiated a rate settlement with its power suppliers (U.S. Sugar Corporation and Glades Electric Cooperative, Inc.), and moved for the dismissal of its application in Docket No. E-7243. The motion was granted on July 6, 1966, 36 FPC 17.

iner's decision. It is our opinion that the basic findings of fact and the conclusions of law in the examiner's comprehensive initial decision are fully supported by the evidence of record, and that these findings and conclusions, as supplemented by our discussion herein, should be approved. We agree with the examiner that FPL owns and operates facilities for the transmission of electric energy in interstate commerce, that these facilities do not fall within the local distribution exemption provisions of Section 201(b) of the Federal Power Act, and that FPL must file original cost statements and comply with all other requirements of the Commission's Regulations under such Act.

Inasmuch as the examiner's decision sets forth in detail the factual background of this proceeding and the legal principles applicable thereto, we shall not recite the factual details in full, but shall refer essentially to those raised by FPL and the Florida Commission in their exceptions.

The record shows that FPL is engaged in the generation, transmission, distribution, and sale at wholesale and at retail of electric energy in the State of Florida. It is the largest electric utility in the state, with a net dependable generating capacity of 2.8 million kw, and it supplies service to about 931,400 customers in more than 500 cities, rural communities and adjacent areas. As of December 1964,[2] it operated ten steam-electric generating plants interconnected by a transmission grid of 2,500 miles, of which 1,400 miles operate at high voltage, 115 kv or above. On the basis of national standing, FPL is one of the most important electric utilities in the United States. In 1965 its rank was ninth nationally in revenues, fourteenth

[2] Unless otherwise noted, the figures stated are approximate and are for the calendar year 1964.

in investment in gross electric utility plant, and sixteenth in kilowatt hour sales.

FPL is directly interconnected with four other Florida electric systems, as follows: Florida Power Corporation (Corp), Tampa Electric Company (Tampa), Orlando Utilities Commission (Orlando), and the city of Jacksonville (Jacksonville). FPL, Corp, and Tampa form the Florida Operatin Committee (Florida Pool) with Jacksonville and Orlando as associate members. The Florida Pool meets several times a year to consider mutual problems relating to the interconnected operation of the systems, including the coordination of spinning reserves, the arrangement of compatible plant maintenance schedules, and the coordination of plans for the construction of transmission lines and the staggered construction of generating units. The spinning reserves of the Florida Pool equal the generating capacity of the largest single unit of the five-member systems, and by voluntary agreement of the members, are shared proportionally. According to FPL's reports in its FPC Form No. 12 for 1964, its required reserve capacity for that year was 404,000 kw, of which amount it supplied 172,000 kw. The balance of 232,000 kw was reported as being available from the other members of the Florida Pool.

FPL exchanges a substantial amount of electric energy with the other members of the Florida Pool. During 1964 FPL transferred a total of 189,422,000 kwh to the four other Pool members, and received in return a total of 199,059,000 kwh, itemized as follows:

Kwh transferred from FPL to:	
Corp	107,642,000
Tampa	43,081,000
Jacksonville	17,268,000
Orlando	21,431,000

Kwh transferred to FPL from:	
Corp	61,589,000
Tampa	59,404,000
Jacksonville	18,181,000
Orlando	59,876,000

The electric energy interchanged by FPL in 1964 totaled three percent of its net generation of 12 billion kwh.

Corp, which is interconnected with Tampa and Orlando as well as with FPL, is also interconnected with power companies outside of the State of Florida. Thus, it is directly interconnected with Georgia Power Company (Georgia), a subsidiary of The Southern Company (Southern). Southern is a holding company whose other subsidiaries are Gulf Power Company (Gulf) which operates in northwestern Florida, Alabama Power Company (Alabama), and Mississippi Power Company (Mississippi). Corp is also directly interconnected with Gulf, and Gulf is interconnected with Georgia and Alabama. Corp has an agreement with the subsidiaries of Southern whereby Corp makes 100,000 kw available to these subsidiaries during the summer, and in return, the subsidiaries make 100,000 kw available to Corp during the winter. During 1964 Southern delivered 167,476,000 kwh to Corp, and Corp delivered 157,324,000 kwh to Southern. Of these totals, approximately 97,000,000 kwh represented deliveries from Georgia to Corp, and 82,000,000 kwh represented deliveries from Corp to Georgia. In addition, 3.9 million kwh were wheeled for the Southwestern Power Administration over Southern's lines across the Georgia-Florida state line to Corp. Georgia is also interconnected with Duke Power Company, Tennessee Valley Authority, and Southeastern Power Administration. These systems operate in states beyond Georgia.

FPL and the other members of the Florida Pool are also members of a multi-state electric network, the Southeast Region of the Interconnected Systems Group (ISG) which covers the southeastern and central portions of the United States. FPL's membership in the ISG provides acceptable frequency control and also automatic assistance during emergencies in the event of any generation outage of less than 100 mw on its system. In this connection it may be noted that 12 of FPL's 24 generating units generate 75 mw or less. An outage of any of these units would lead to almost instantaneous assistance to FPL. FPL, in turn, operates in synchronism with the 140 members of ISG and is ready to assist them in case of emergency. Thus, FPL contributed 8 mw to ISG to assist a midwestern utility which had sustained a 580-mw generator loss.

The testimony and evidence of record support the Examiner's findings that the electric power on all the interconnected systems in which FPL, Corp, and Georgia participate is supplied as alternating current at a frequency of 60 cycles; that the frequency of each system is in synchronism with that of all the others in the interconnection; that there is a tie-line bias with frequency control on the interconnected system which permits a free flow of power and energy throughout the networks in which FPL, Corp, and Georgia participate; that all 140 members of the ISG operate in parallel and are interlocked electromagnetically; and that FPL can receive from or contribute to ISG up to 100 mw. The record further supports the Examiner's findings that FPL normally has no control over the actual transfers of electric power and energy with any particular electric system with which it is interconnected; that since electric energy can be delivered virtually instantaneously when needed on a system at

a speed of 186,000 miles per second, such energy can be and is transmitted to FPL when needed from out-of-state generators, and in turn can be and is transmitted from FPL to help meet out-of-state demands; and finally, that there is a cause and effect relationship in electric energy occurring throughout every generator and point on the FPL, Corp, Georgia, and Southern systems which constitutes interstate transmission of electric energy by, to, and from FPL.

In its exceptions FPL argues that there is no substantial record support for the Examiner's finding that it is engaged in the transmission of electric energy in interstate commerce. We find no merit in this argument. The Examiner concluded that the operation of FPL in electromagnetic unity with the suppliers in and outside of Florida in and of itself demonstrated that it owned and operated facilities for the interstate transmission of electric energy. This finding is also supported by the evidence produced by staff at the hearing which convincingly establishes that electric energy is transmitted in interstate commerce to and from FPL's lines. The nature of staff's showing is fully consistent with, and satisfies the tests which we have established in numerous opinions issued in the last two years to support a finding that wholesale sales are in interstate commerce. See *Indiana & Michigan Electric Company,* Opinion No. 458, 33 FPC 739, affirmed *Indiana & Michigan Electric Company* v. *Federal Power Commission,* 365 F. 2d 180 (CA7–1966), certiorari denied, 385 U.S. 972; *Arkansas Power & Light Company.* Opinion No. 473, 34 FPC 747 (1965), affirmed *Arkansas Power & Light Company* v. *Federal Power Commission,* 368 F. 2d 376 (CA8–1966); *Public Service Company of Indiana, Inc.,* Opinion No. 483, 34 FPC 1513 (1965), affirmed

in *Public Service Company of Indiana, Inc.* v. *Federal Power Commission*, 375 F. 2d 100 (CA7–1967); the *Cincinnati Gas & Electric Company*, Opinion No. 485, 35 FPC 99 (1966). Certainly it is reasonable to rely on the methodology used in the above cases to demonstrate that particular sales are in interstate commerce to establish in this proceeding that FPL itself is engaged in the interstate transmission of electric energy and is thus a "public utility" within the meaning of the Act.

Thus through the application of the same techniques here that it had utilized in those other cases staff demonstrated by its record exhibits the flow of energy from Georgia across the Georgia-Florida state line through Corp's system and into FPL's transmission lines, as well as a reverse flow from FPL's lines through Corp's system to Georgia. See Staff's Exhibit Nos. 18, 19, 32, and 33.[3] For example, Staff's Exhibit No. 18, at page 6, graphically demonstrates that on September 28, 1964, at 7:00 o'clock p.m., there was a flow of 51,000 kw of interstate power from Georgia to Corp and an instantaneous flow of 50,000 kw of commingled interstate and intrastate power from Corp to FPL. We are not persuaded by FPL's exceptions that the Examiner committed error in basing his findings on such staff exhibits rather than on FPL's

[3] Staff's Exhibit No. 18 shows the flow of energy from Georgia through Corp's system and into FPL transmission lines via the Jasper-Fort-White-Turner-Sanford interconnections on designated hours of 22 days out of a 4-month period in 1964. Staff Exhibit No. 19 indicates the presence of such flows during hours earlier than 7:00 a.m. on 20 of the 22 days listed in Exhibit No. 18. Staff Exhibit No. 32 further shows that energy transmitted from FPL's Sanford Plant flowed during 3 days of the same 4-month period over Corp lines into the Georgia Power System via the Turner-Fort-White-Jasper interconnections.

own system studies which FPL contends show that no Georgia energy can enter the FPL lines and that no FPL energy can flow as far north as Georgia.

As ably explained by the Examiner, the power flow studies prepared by staff all rest on the concept that there is a commingling of energy from different sources at a bus with the result that the energy which flows away from such bus is so fully commingled as to consist of energy which has entered such bus both from interstate and intrastate sources. Staff recognizes that energy flows to and from a bus as three-phase alternating current, and staff treats a bus as a point, or a tank, or a reservoir where all the energy supplied to the bus is commingled. The studies prepared by FPL, on the other hand, treat the bus as having physical dimensions, and replace each three-phase alternating current bus structure by a single conductor bus. FPL uses the point-to-point tracing principles of direct current circuits with static power sources and with steady state power flows. This steady state method treats the power flow through the bus as constant in value and direction, on the basis that balanced three-phase power under steady state conditions is constant in value and direction from instant to instant. Although FPL's method may lend itself to a theoretical showing of energy flow which may demonstrate that energy will flow from a certain source to a certain load,[4] this method does not fully or accurately reflect

[4] The steady state method was used to establish the fact of such a flow in *City of Colton, California* v. *Southern California Edison Company*, Opinion No. 346, 26 FPC 223, 234 (1961), *affirmed sub nom. Federal Power Commission* v. *Southern California Edison Company*, 376 U.S. 205 (1964), reversing 310 F. 2d 784 (CA9–1962). FPL's reliance on staff's use of the steady state method in *Colton*, however, is misplaced. As the Commission pointed out in its opinion in that case, the

the actual operation of a bus, and it does not show the physical reality of a three-phase electric power system as satisfactorily as does staff's concept. Certainly FPL's method is of no value in demonstrating a negative, namely, that energy will not flow through a bus to a certain specific transmission line. Yet, FPL's reliance on this method in this proceeding seeks to prove just such a negative.

The Examiner correctly found that staff's commingled method reflected the physical reality of the bus better than did FPL's steady state or systems studies method. The essential soundness of the commingled method has long been recognized and approved. See *Pennsylvania Water & Power Co.* v. *Federal Power Commission,* 343 U.S. 414 (1952); *Wisconsin Michigan Power Co.* v. *Federal Power Commission,* 197 F. 2d 472 (CA7–1952), cert. denied, 345 U.S. 934 (1953). Our adoption of the Examiner's holding on this point certainly is consistent with our repeated approval of the commingled method in recent jurisdictional proceedings where we have found a need for precise methods in analyzing power flows on highly complex systems involving a multiplicity of interconnections. See our opinions in *Indiana & Michigan* and *Arkansas,* cited at pp. 549, 550, *supra.*[5]

Consideration has been given to FPL's assertion that because of the unique peninsular nature of its service area it planned its system to be self-sufficient,

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result reached by staff's technique would have been the same had staff there treated the bus as a point under the commingling concept.

[5] In view of the above showing of substantial flows of interstate energy to and from FPL's system, it is clear that FPL owns facilities which do not come within the purview of the exemptions to the Commission's jurisdiction set forth in Section 201(b) of the Act.

and that it possesses sufficient generating capacity of its own to meet its loads without any dependence upon the spinning reserves or emergency power of other Florida or out-of-state systems. We do not find this assertion persuasive. The fact that FPL could operate as a self-sufficient utility is not controlling because FPL simply does not operate its system in that manner. The record in this proceeding makes it plain that FPL receives substantial benefits from its participation in the Florida Pool in the coordination of spinning reserves, the arrangement of plant maintenance schedules, and the assurance of reliability of frequency control and from both the Florida Pool and ISG in the form of automatic assistance in the case of emergencies. As we stated in our opinion in *Indiana & Michigan Electric Company, supra,* it is the system's actual mode of operation, not how the system could operate, that is important. Moreover, the particular operating pattern actually used by FPL is consistent with sound operating practices and with the principles enunciated in the Commission's National Power Survey issued in December 1964 in which all segments of the electric power industry participated fully and cooperatively.

We have also considered FPL's contention that it receives virtually no benefits from its membership in ISG with respect to emergency assistance because of its assertion that the Florida peninsula would be electrically isolated from the states to the north in the event of an outage of approximately 100 mw or greater This contention minimizes the fact that ISG aid to FPL is available as emergency assistance in the case of any outage of less than 100 mw. As we pointed out above, 12 of FPL's 24 generating units generate 75 mw or less. The emergency outage of any one of these units would automatically bring ISG aid to FPL in

the event that FPL's own reserves and the reserves of the other members of the Florida Pool were not instantaneously available. It appears that this is at least one of the contingencies which an emergency assistance agreement contemplates.

FPL urges that the Commission should decline to exercise jurisdiction in this proceeding, stating that any transmission of interstate energy which may have been accomplished is *de minimis*, and that the exercise of Commission jurisdiction would subject FPL to most burdensome additional costs without serving the public interest.

Assuming, *arguendo*, that we have discretion, this is not a case where the Commission should decline to exercise its jurisdiction. The Commission has already determined that jurisdiction does not depend upon a finding of any particular volume or proportion of interstate energy flowing in a system and this position has been upheld in the courts. *Connecticut Light and Power Company* v. *Federal Power Commission*, 324 U.S. 515, 535–536 (1945); *Jersey Central Power & Light Co.* v. *Federal Power Commission*, 319 U.S. 61 (1943); *Public Service Company of Indiana* v. *Federal Power Commission*, 375 F. 2d 100 (CA7–1967). Similarly, we do not believe that, where there are other benefits accruing to a company under the interconnected operating arrangements, the amount of energy flowing interstate should be decisive on the question of whether we ought to decline to exercise jurisdiction. Here the role played by FPL in the Florida Pool, in aiding Corp to interchange energy with Georgia and the other subsidiaries of Southern, and in the ISG is of greater significance than the actual volume of energy exchanged by it would ordinarily indicate. And this volume of energy, although

constituting but a small percentage of FPL's total generating capacity,[6] is nevertheless not insubstantial.

In considering FPL's request that we decline jurisdiction here, the Commission cannot ignore the fact that information recently filed by FPL in its Form No. 12 for 1965 shows that FPL's interchange of energy with other members of the Florida Pool was 300 percent greater in number of kilowatt hours in 1965 than in 1964. Nor can we ignore the record showing that the members of the Florida Pool, in considering their generating and transmission needs for 1970, have studied plans which contemplate stronger interconnections with the utilities in the Southern Company, to the extent of anticipating the capability of transfer of as much as 350,000 kw to 400,000 kw with Southern. FPL's role in these future plans for growth and interconnection obviously is a vital and significant one. As the largest electric utility in the State of Florida, and as one of the major electric utilities in the United States. FPL's importance in insuring the increased reliability of interconnected power systems in Florida and in adjoining states is self-evident. We do not believe than the public interest will be served by any Commission ruling which would tend to inhibit FPL from a sound and efficient expansion of its participation in the Florida Pool and ISG

[6] We do not find satisfactory record support for FPL's claim that the interstate energy which flows into its system is no more than 1/7000 of one percent of the total energy delivered to FPL's customers. FPL apparently arrived at this figure by assuming that the power flowing across the state line from Georgia could be traced to the Sanford-Turner interconnection between Corp and FPL. In so doing FPL ignored the effect of commingling of energy from different sources, and also ignored the fact that Georgia power may flow into its system over three other high voltage tie-lines.

interconnections. Yet FPL's request that we decline jurisdiction here because its past interstate transmission activities have allegedly been small, could, if granted, very well inhibit it from participating in future interconnection programs, and could conceivably cause it to restrict its present interconnection arrangements to its own detriment and to the detriment of other Pool members. Plainly, the public interest will not be served by this result.

The suggestion by counsel for FPL during the oral argument that we should wait to consider assuming jurisdiction until there is an actual complaint by a wholesale customer, either existing or potential, misconceives the broad statutory design which Congress had in mind in enacting Parts II and III of the Federal Power Act. Congress sought not only to give this Commission exclusive jurisdiction over wholesale sales in interstate commerce, but, in addition, to supplement local regulations at the federal level in such areas as accounting, interlocking directorates, mergers and consolidations, and the promotion of interconnection and coordination of the nation's facilities for the generation, transmission and sale of electric energy. None of these latter objectives depend upon the extent of wholesale sales or the percentage of interstate transmission in any particular case. The independent importance of these regulatory activities was spelled out in detail by the Commission, in light of the Act's legislative history, almost 20 years ago in the *Connecticut Light and Power* case, *supra*. FPL has presented no argument which would now persuade us to a contrary conclusion.

We agree with the Examiner that FPL will not be subjected to any unduly burdensome costs by our requirement that it keep its accounts in accordance with the Commission's Uniform System of Accounts for

Public Utilities. Although FPL asserts that it will incur more than $500,000 additional annual costs if it must comply with the Commission's accounting requirements, its contention is unsupported on the record before us. With respect to reporting, FPL presently files this Commission's principal report forms, FPC Form No. 1, Annual Report, and FPC Form No. 12, Power System Statement, as required under Section 311, among other sections, of the Power Act. Nor should any substantial expense result from FPL's compliance with the Commission's accounting requirements. FPL presently keeps its plant accounts on an original cost basis and maintains its books of account in accordance with the NARUC (National Association of Railroad and Utilities Commissioners) system of accounts which are similar to those of the Commission's Uniform System of Accounts.

FPL's further assertion that it will incur an estimated 4 to 6 million dollar expense to complete an initial plant inventory required by the Commission's Uniform System of Accounts is based upon indefinite and conjectural evidence, and plainly reveals a definite misunderstanding of what is required of it under the Commission's regulations. Thus, FPL's estimate of these costs erroneously includes the sum of approximately $3,200,000 for an aerial map survey of its system, when the Commission's requirements do not require such an aerial survey. Also, it appears that FPL's cost predictions are based upon costs incurred by other electric utilities in compiling their plant inventories for the Commission's regulatory purposes in prior years. The studies made by these other companies are not comparable because their plant accounts were not kept pursuant to a uniform

system of accounts at that time. On the other hand, FPL has been keeping its plant accounts on an original cost basis at least since 1951, and was required to make a complete reclassification of its plant accounts on an original costs basis by the Securities & Exchange Commission as of January 1, 1942. FPL's witness at the hearing admitted that to his knowledge FPL had not contacted any members of this Commission's accounting staff to obtain information concerning the requirements of complying with the Commission's Uniform System of Accounts, and also conceded a lack of knowledge as to whether or not FPL's reclassification studies accepted by the Securities & Exchange Commission in 1942 and the years thereafter would be accepted by the Commission. In this connection, it may be added that FPL apparently gave no weight to the fact that the Commission's auditing procedures are designed to avoid any unnecessary overlapping or duplication of state commission audits, and that joint federal and state audits are encouraged. In light of the foregoing circumstances, we find that the Examiner correctly concluded that it would not be burdensome for FPL to conform to the Commission's accounting requirements.

To the extent that FPL seeks exemption from the Commission's accounting requirements because its transmission of energy is predominantly intrastate, we deem it appropriate to restate our language in *The Connecticut Light and Power Company,* 6 FPC 104, 108 (1947), as follows:

> The legislative history of the Act shows, furthermore, that it was anticipated in Congress that the federal accounting requirements would apply to utilities predominantly engaged in lo-

cal business subject to State regulation. Thus, Representative Cole, explaining the bill in the House on behalf of the House Committee, said (79 Cong. Rec., Part 9, p. 10384):

> A uniform system of accounting is established, and because of the demand therefor and the admission on the part of most everyone that such is advisable, the provisions therefor will very likely be required of companies now subject to State regulation because of a small fraction of their business being under the Federal Commission. We have thought this advisable because it is most necessary to have uniformity in accounting as well as depreciation instead of 48 different methods. This provision will be followed, in my judgment, by the adoption by the State Commission of such uniform method as the Federal Power Commission will prescribe.

Significantly, Congress rejected efforts to amend the Act to exempt utilities regulated by a state commission, and the legislative debates at that time showed that the proponents of the Act regarded it essential that the Commission possess the power to get accounting information under a unified accounting system, regardless of the fact that a reporting utility might also be subject to state regulation. In light of this background, we do not find that the public interest will be served by exempting FPL from compliance with the Commission's accounting requirements.

The Commission further finds:

(1) Florida Power & Light Company (FPL) is a corporation organized and existing pursuant to the laws of the State of Florida.

(2) FPL owns and operates facilities, among others, for the transmission of electric energy trans-

mitted from points of generation in the States of Georgia and Florida to points of consumption outside the State in which it is generated, which facilities are in addition to, and do not include, facilities used for the generation of electric energy, facilities used in local distribution or only for the transmission of electric energy in interstate commerce, or facilities for the transmission of electric energy consumed wholly by the transmitter.

(3) FPL is, therefore, a public utility within the meaning of that term as used in Section 201 of the Federal Power Act and subject to the jurisdiction of the Commission.

(4) FPL, as a public utility under the Federal Power Act, should be ordered, *inter alia,* to file with the Federal Power Commission original cost statements in the manner provided in Section 120.3 of the Commission's Regulations under the Federal Power Act and Electric Plant Instruction No. 1 of the Commission's Uniform System of Accounts Prescribed for Public Utilities and Licensees Subject to the Provisions of the Federal Power Act.

(5) The exceptions of FPL and of the Florida Commission to the Examiner's initial decision should be denied.

The Commission orders:

(A) Within 60 days after the issuance of this order, FPL shall file with the Federal Power Commission original cost statements in the manner provided in Section 120.3 of the Commission's Regulations under the Federal Power Act and Electric Plant Instruction No. 1 of the Commission's Uniform System of Accounts Prescribed for Public Utilities and Licensees Subject to the Provisions of the Federal Power

Act, and shall comply with all requirements of the Commission's Regulations under such Act.

(B) The decision of the Presiding Examiner, as supplemented above, is adopted as the decision of the Commission.

(C) The exceptions to the Examiner's decision are denied.

Commissioner Carver, *joined* by Commissioner O'Connor, *dissenting.*

CARVER, *Commissioner,* joined by O'CONNOR, *Commissioner, dissenting:*

By eschewing the opportunity to let this case turn on the exercise of a discretion in the Commission not to take jurisdiction, and electing to have it turn on the "commingling" test of jurisdiction, the Commission has made it necessary for me to dissent.

This dissent does not stem from sympathy for the Florida Power & Light Company, whose arguments against being regulated, particularly in the matter of the impact of conformance with the Uniform System of Accounts, affront the legislative purpose. Congress did not saddle consumers with "unnecessary" costs, when it directed the Commission to set up a uniform accounting system.

Nor is my dissent based upon a belief that the Commission has misread or misinterpreted the thrust of certain recent judicial pronouncements on the "commingling" theory. The cases cited are distinguishable on the facts, but the thrust is in the direction the Commission has taken.

The vice I find in the Commission's decision, which prevents me from joining in its statement, is that its adoption of the commingling theory as a test for jurisdiction *per se,* interprets the Federal Power Act,

to have a reach beyond that which I find in the statute.

The Federal Power Act is today found to grant to the Commission jurisdiction over *any* company which generates electric energy in the form of alternating three-phase 60-cycle current, if that company is interconnected and electromagnetically synchronized with any other generating source producing electric energy in the same form in another State.

More than 90% of the Nation's electric generating capacity is interconnected in this fashion. The only major exception is the electric generation of Texas, which is interconnected within Texas but not with out-of-Texas systems. Such a test for jurisdiction writes out of the statute the intrastate and industrial exceptions to coverage under the Act, and in doing so objectionably usurps a prerogative of the Congress.

From its outset, the case was tried on the narrow issue of jurisdiction—a so-called "straight status case." Florida Power & Light Company has an interconnection with Florida Power Corporation, at a point 180 miles from the Georgia state line. The decision turns on the theory that at this interconnection, any "flow" of energy from Florida Power Corporation to Florida Power and Light Company may not be assumed to be Florida generated energy from Florida Power Corporation's generating system, but rather to be interstate in origin by reason of the interconnection by the Florida Power Corporation with out-of-Florida generating sources. The Florida Power Corporation system is said to be "permeated" or commingled with out-of-Florida energy.

The facts of interconnection are uncontroverted. Aided by the engineering testimony of the Staff witnesses Jessel and Jacobsen, the Staff's case for the ultimate jurisdictional fact of electric energy in Flor-

ida Power & Light Company's system being transmitted in interstate commerce is this "permeation" or "commingling." The Examiner neatly summarized:

> The cause and effect relationship in electric energy occurring throughout every generator and point on the Georgia, Corp and Florida systems constitutes interstate transmission of electric energy by, to, and from Florida. It is the electromagnetic unity of response of Florida, Corp, Georgia and other interconnecting systems that constitutes the interstate transmission of electric energy by Florida." (Ex. Dec., *infra*, p. 568.)

In undertaking to temper the impact of the Examinter's forthrightness (a forthrightness conforming to the theory upon which Staff's case was submitted), the Commission turns to Exhibit 18 as supporting a Commission finding (as opposed to an Examiner's finding) that interstate energy reached the system of Florida Power & Light Company. But that exhibit (or any exhibit) shows no more than that "commingled" energy reached the Florida Power & Light Company system. This assumes the fact in issue, and thus begs either the question of jurisdiction or the question of substantiality or both. No staff exhibit purports to depart from the assumptions made to support the "commingling" theory.

The Examiner fairly recognized that "commingling" is only a theory. But he found that the theory of commingling was sound and proved, and that its proof obviated tracing.

If commingling obviates tracing, then the reach of the Commission's jurisdiction is plenary. Furthermore, it has become plenary in 1967, while the act was passed in 1935 and has not been changed by Congress (in respects material here) since.

The Supreme Court in *Connecticut Light and Power Co.* v. *F.P.C.*, 324 U.S. 515, at 515, credited the Congress with determining that

> federal jurisdiction was to follow the flow of electric energy. (at 529)

But is federal jurisdiction to follow the changes in the theories which are devised by company or Commission engineers to describe a still-mysterious phenomenon? For myself, I cannot accept the premise that the "commingling" theory can change the law as radically as to eliminate two explicit exceptions to our jurisdiction.

Turning to the cases cited by the majority, most of these cases involved jurisdiction over wholesale sales, not jurisdiction *per se*. The two "straight status" cases in the Supreme Court reports—*Connecticut Light and Power Company* v. *F.P.C.*, 324 U.S. 515 (1945), and *Jersey Central Power & Light Co.* v. *F.P.C.*, 319 U.S. 61 (1942)—do not support the approach used here, and the Commission's opinion today is directly contrary to the latter's statement (at 319 U.S. 72) that "mere connection determines nothing." Today's decision has connection determining everything.

The cases cited in the Commission's opinion, although sales cases not solely status cases, carry the process of interpreting legislative language *almost* as far as the Commission goes today. The final step may be a short one, but short or not, it is legislative.

The discussion which asserts that the commingling or electromagnetic synchronism test for jurisdiction under Section 201 of the Federal Power Act supports the public interest in the expansion and extension of interconnection arrangements for greater service reliability is not persuasive. I fully agree that interconnections serve the objective of reliability, and that reliability is strongly in the public interest. But with the present near universality of interconnections, it would seem that the Commission's opinion would as

likely lead to present connections being broken as to new connections being established or existing connections strengthened.

Congress may have intended that the provision of Section 201(b) which states that the Commission "shall not have jurisdiction * * * over facilities used * * * only for the transmission of electric energy in intrastate commerce, or over facilities for the transmission of electric energy consumed wholly by the transmitter" was to have a diminishing effect with the passage of time; but I do not think that Congress can be said to have intended this diminution to proceed to the vanishing point. It reaches that point for all practical purposes when the Commission adopts the commingling test for determining interstate flows after virtually the entire electric generating capacity of the United States is interconnected under electromagnetically synchronous conditions.

My doubts that the statute should be so read are reinforced when the diminished meaning of Section 202 following the application of the commingling test is considered.

The stated purpose of Section 202 was to assure an abundant supply of economical energy by *voluntary* interconnection of facilities. If jurisdiction inexorably follows interconnection, the nonjurisdictional utilities cannot retain any aspect of their independence once they agree to interconnect. Impregnation is indivisible. Such a reading of Section 202 is hardly conformable to its general spirit, and is inconsistent with the legislative history, of this part of the Act.[1]

Another consideration, not related to the scope of the statute, suggests itself. The Commission's adoption

[1] Senate Report No. 621 on S. 2796, 74th Cong., 1st Sess., at p. 49, May 13, 1935; and House Report No. 1318 on S. 2796, 74th Cong., 1st Sess., at p. 27, June 24, 1935.

of the commingling theory conceivably could deny to a small utility remote from its supplier's generation the opportunity to object to wheeling charges on a mileage or rolled-in cost basis, as opposed to cheaper charges based on a displacement theory. The far-reaching commingling theory adopted today could prove embarrassing to the Commission, which presumably would not want to have one rule for establishing jurisdiction, and another for regulating under it.

I do not wish to be misunderstood. From the standpoint of it being the largest electric utility in Florida, on the basis of its being nationally ninth in revenues, fourteenth in plant investment, and sixteenth in energy sales, and from the standpoint of the upward trend in its energy transactions with interconnected companies, Florida Power & Light Company probably ought to be under Federal Power Commission regulation.

But our adjudicative responsibilities do not turn upon what the law ought to be, but upon what it is. Counsel for the company candidly admitted that the law as it is quite possibly would apply to one of his company's wholesale sales. Such a result might be equally offensive to my reading of the statute, but it would have the merit of resting squarely upon decided cases. We elected to plow new ground with a straight jurisdictional approach, and absent square authority, I find the result to constitute too great a stretching of our charter. I would reverse the Examiner, and let a jurisdictional finding wait for a sale case.

FLORIDA POWER & LIGHT COMPANY, DOCKET No. E-7210

ORDER DENYING APPLICATION FOR REHEARING

(Issued May 2, 1967)

On March 20, 1967, 37 FPC 544, the Commission issued Opinion No. 517 and accompanying order in the above-entitled proceeding. Application for rehearing of this Opinion and order has been timely filed under Section 313(a) of the Federal Power Act by the Florida Power & Light Company.

In Opinion No. 517 and order the Commission found that the Florida Power & Light Company (FPL) is a public utility within the meaning of that term as used in Section 201 of the Federal Power Act and subject to the jurisdiction of the Commission because FPL owns and operates facilities, among others, for the transmission of electric energy transmitted from points of generation in the States of Georgia and Florida to points of consumption outside the State in which it is generated. The Commission further found that these facilities are in addition to, and do not include, facilities used by FPL for the generation of electric energy, facilities used in local distribution or only for the transmission of electric energy in intrastate commerce, or facilities for the transmission of electric energy consumed wholly by the transmitter. The Commission ordered FPL to file original cost statements in the manner provided in Section 120.3 of the Commission's Regulations under the Federal Power Act and Electric Plant Instruction No. 1 of the Commission's Uniform System of Accounts Prescribed for Public Utilities and Licensees Subject to the Provisions of the Federal Power Act. FPL was

also ordered to comply with all requirements of the Commission's Regulations under such Act.

FPL requests that the Commission grant rehearing and thereafter issue a new order dismissing this proceeding on the merits, asserting that the Commission's findings as above described are without basis in law or in fact. In support of its application for rehearing, FPL lists numerous specific findings which it contends represent error on the part of the Commission.

Upon consideration of FPL's application the Commission finds that the arguments advanced by FPL are essentially the same as those set forth in its brief to the Examiner and in its exceptions to the Examiner's initial decision. These arguments were covered in the Examiner's decision and were rejected in the Commission's Opinion No. 517. No new facts or arguments are presented which would be cause for granting rehearing or disturbing the original Opinion and order.

The Commission finds:

The assignments of error and grounds for rehearing set forth in the above-described application for rehearing present no fact or principles of law which were not considered by the Commission when it issued its Opinion No. 517 and accompanying order on March 20, 1967, and which having now been considered warrant any change in or modification of said Opinion and Order.

The Commission orders:

The application for rehearing filed by the applicant, Florida Power & Light Company, on April 11, 1967, is hereby denied.

Commissioners Carver and O'Connor *dissenting* for the reasons set forth in their dissent to Opinion No. 517 issued March 20, 1967.

APPENDIX D

INITIAL DECISION OF THE PRESIDING EXAMINER IN INVESTIGATION TO DETERMINE JURISDICTION

(Issued July 12, 1966)

I

INTRODUCTION

WENNER, *Presiding Examiner:* Florida Power & Light Company (Florida) engages in the generation, transmission, and distribution at wholesale and retail of electric energy throughout major portions of Florida. The essential issue in this case is whether Florida is a public utility—whether the Commission has jurisdiction over it under Section 201 of the Federal Power Act. This depends on whether Florida operates facilities for the transmission of electric energy in interstate commerce.

If the Commission has jurisdiction over Florida, Florida is required to maintain its accounts according to the Commission's Uniform System of Accounts; therefore, whether Florida should so maintain its accounts is in issue in this proceeding. But there is not in issue in this proceeding any rate matter. However, if Florida is found to be a public utility, the Commission would have jurisdiction in other proceedings with respect to the rates of such of its sales for resale which are in interstate commerce, and also with re-

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spect to compelling its physical interconnection with other systems. But decisions on these matters are not in issue in this proceeding.

II

THE CENTRAL ISSUE: DOES FLORIDA TRANSMIT INTERSTATE ELECTRIC ENERGY?

The first and indeed the major question in this proceeding is: Does Florida transmit interstate electric energy? There are many significant factors which bear on this issue, but these two are major:

(1) Florida is interconnected with Florida Power Corporation (Corp), another Florida electric utility company. Substantial amounts of electric power are interchanged between Florida and Corp.

(2) Corp is interconnected with Georgia Power Company (Georgia), which operates in Georgia. Substantial amounts of power are interchanged between Corp and Georgia.

So the question becomes: Is electric energy transmitted between Georgia and Florida via Corp?

We turn to the details of the problem of interstate transmission, considering first the particular interchanges themselves and the interrelationships among the various participants, because these may cast light on the nature of the interstate transmission, if any, and then the question of interstate transmission itself.

III

THE FLORIDA SYSTEM: INDEPENDENCE AND INTERDEPENDENCE

Florida provides electric service to the east coast of the state, except for the Jacksonville area and that of

five other municipal systems. As of December 1964,[1] it operated ten steam-electric generating plants located in various parts of its system. These are interconnected by a transmission grid of 2,500 miles, of which 1,400 miles operate at high voltage, 115 kv or above. Florida has a net dependable generating capacity of 2.8 million kw.

The generation of electric energy over Florida's system is controlled by a computer in its dispatching office at Miami. Loads on Florida's system constantly change from moment to moment as machines and lights are turned on and off by customers. The computer arranges for load changes to be met by adjusting generation at the various units on Florida's system so that energy to meet the new load is provided in the most economic way. These computer assignments are based on the respective generating unit efficiencies, transmission line losses, and fuel costs at various plants. Under this computer control Florida's system is operated as a unified system, not as a collection of connected plants.

Corp and Tampa Electric Company, both electric companies in the state and which are interconnected with Florida, also operate similar automated systems.

A. Florida's Independence

Florida's generating capacity is installed essentially to serve its own loads. In the main, it has adequate generating capacity to meet its own loads. Its plans are based on its continuing, in the main, to supply its own needs in the future.

B. Florida's Interdependence

Florida has relationships and is interconnected with four other Florida electric systems, Corp, Tampa Elec-

[1] Unless otherwise noted, all figures are approximate and are for the calendar year 1964.

tric Company (Tampa), Orlando Utilities Commission (Orlando), and the City of Jacksonville (Jacksonville).

Florida, Corp and Tampa form the Florida Operating Committee with Jacksonville and Orlando as associate members. The Committee meets several times a year to consider mutual problems relating to the interconnected operation of the systems.

The following amounts of electric energy were exchanged during 1964 between Florida, on the one hand, and the other members of the Florida Operating Committee, on the other.

Transferred from electric utility system	Transferred to electric utility system	Amount transferred (kilowatt-hours)
Florida Power & Light Co	Florida Power Corp	107,642,000
Florida Power Corp	Florida Power & Light Co	61,598,000
Florida Power & Light Co	Tampa Electric Co	43,081,000
Tampa Electric Co	Florida Power & Light Co	59,404,000
Florida Power & Light Co	City of Jacksonville	17,268,000
City of Jacksonville	Florida Power & Light Co	18,181,000
Florida Power & Light Co	Orlando Utilities Commission	21,431,000
Orlando Utilities Commission	Florida Power & Light Co	59,876,000

As indicated on the table above, power between Florida and each of the other members of the Committee was exchanged in both directions. The electric energy so interchanged by Florida totaled three percent of its net generation of 12 billion kwh.

The energy is interchanged on either a scheduled or inadvertent basis. Scheduled transactions take place after discussion between the dispatchers for each system and are based on the needs of one part and the availability of power on the part of the other, on a "when, as and if basis." During the system peak the five members of the Florida Operating Committee exchange information daily on the amount of spinning reserves each expects to carry. The purpose of the energy interchanges is to take care of temporary

needs. There are no economy sales (sales by a company that can produce lower cost power to a higher cost producer) because fuel costs are similar for all members.

There are also inadvertent power flows, the free flow of power that occurs between two interconnected systems when there is a difference between the angle of the voltage or the magnitude of the voltage on one side of the point of interconnection compared to the other. Inadvertent interchange of energy includes intentional interchange energy resulting from the use of frequency bias as well as unscheduled interchange resulting from human or equipment errors.

Interchanges of power are measured, netted, and payment is made for the balance at regular intervals.

In its 1965 Form 12 report Florida lists its reserve capacity at 656,000 kw, 411,000 kw from its own system, and in addition, from the other members of the Florida Operating Committee, "Reserve capacity usually available amounts to 245,000 kw. This is spinning reserve instantly available for emergencies from Florida Power Corporation, Tampa Electric Company, City of Jacksonville and Orlando Utilities Commission." Florida also contributes to the joint reserves of the other members of the Florida Operating Committee.

The arrangements regarding reserves available from the other members of the Florida Operating Committee are not written or firm guarantees. On many occasions the reserve available from each of the members of the Florida Operating Committee has been less than 80% of its allocated share.

The Committee also coordinates the overhaul and maintenance schedules of the five systems so that too many large units are not out of service at a time when they may be needed.

The coordination of reserves, overhaul and maintenance by the Florida Committee is by mutual agreement. The agreements are oral and informal, and are recorded in the minutes of the Committee meetings. There are no sanctions for non-compliance. There is no centralized directorate or administrative nucleus to direct operations. Some other interconnected systems also operate in a similar manner.

C. The Florida, Corp, Georgia Relationship

Corp is interconnected with Florida as well as two other members of the Florida Operating Committee, Tampa and Orlando. Corp is also interconnected with Georgia. Thus Corp is interconnected with Florida on the south and with Georgia on the north.

Georgia is a subsidiary of The Southern Company (Southern), a holding company whose other subsidiaries are Gulf Power Company (Gulf) which operates in northwestern Florida, Alabama Power Company (Alabama), and Mississippi Power Company. Corp is interconnected with Gulf, and Gulf is interconnected with Georgia and Alabama. Pursuant to an agreement between the subsidiaries of Southern, on the one hand, and Corp, on the other, during the summer Corp makes available 100,000 kw to the Southern subsidiaries and during the winter the Southern subsidiaries make available to Corp 100,000 kw. During 1964 Georgia delivered to Corp 97 million kwh and Corp delivered to Georgia 82 million kwh. In addition 3.9 million kwh were wheeled for the Southwestern Power Administration over Southern's lines across the Georgia-Florida state line to Corp. For many days, including peak load periods, there was a flow in both directions during a 24 hour period over the Corp-Georgia interconnection.

Georgia is also interconnected with Duke Power Company, Tennessee Valley Authority, Southeastern Power Administration and others. These systems operate in states beyond Georgia.

D. Florida—A Member of the Interconnected Systems Group

Florida and the other members of the Florida Operating Committee are members of a multi-state electric network, the Southeast Region of the Interconnected Systems Group (ISG) which covers the southeastern and central portions of the country. Florida operates in synchronism with the 140 members of ISG and is ready to assist them or to receive assistance from them in case of emergency. Thus during a 580 mw generator loss by a midwestern utility Florida contributed 8 mw to ISG.

Electric energy transmitted between Corp and Georgia passes through Fort White, a point at the northern part of Corp's system. If power flow exceeds 100 mw at this point the ties open, cutting off the power. Hence assistance between Florida and ISG via the Corp-Georgia interconnection cannot be relied on where the need exceeds 100 mw. However 12 of Florida's 24 generating units generate 75 mw or less. An outage of any of these units would lead to almost instant ISG assistance to Florida. However, no such limitation appears applicable to assistance from ISG via the Florida-Corp-Gulf-Georgia interconnections.

E. Conclusion

Florida is operated, to a large extent, as an independent company. It is also an operation which is interconnected with and interdependent with other Florida electric companies. In turn one of these other

companies, Corp, is interconnected with and interdependent with Georgia which in turn is interconnected with and interdependent with a network of electric systems operating in many states. The situation and relation of Florida to these other systems provides the background for the transmission of energy among them.

IV

THE ELECTROMAGNETIC UNITY OF FLORIDA, CORP, GEORGIA, AND THE TRANSMISSION OF INTERSTATE ELECTRIC ENERGY BY FLORIDA

Under Section 201(c) of the Act electric energy is transmitted in interstate commerce if transmitted from a State and consumed at any point outside thereof within the United States. Granted that electric energy is transmitted between Florida and Corp, and between Corp and Georgia, the question is posed: Is electric energy transmitted to Florida from Georgia or to Georgia from Florida? The answer depends on what constitutes interstate transmission of electric energy.

Electric power on Florida, Corp, and Georgia and all other interconnected systems is supplied as alternating current at a frequency of 60 cycles. Interconnected synchronous operation, or "parallel operation," as the term is used in the industry, requires that the frequency of each system be in synchronism with that of all others in the interconnection. Two or more electric systems cannot (except under special and rare conditions) operate together unless they are in synchronism. This means that the current pulses on these systems, and thus the frequency, coincide exactly; not approximately, but exactly. Birmingham is served by Alabama which is interconnected with Georgia which

is interconnected with Corp. Miami is served by Florida which is interconnected with Corp. The frequency of the pulses is exactly the same in Miami and Birmingham, and if it changes to a new value in Birmingham, then it changes to exactly that same value in Miami. The speed of every electric generator on every electric system in an interconnected group is irrevocably locked to the same frequency. A variation in one affects all.

The line bias with frequency control is the technique used to maintain frequency at 60 cycles on interconnected electric systems operating in synchronism, such as Florida, Corp and Georgia, and is also used to match generation with net system load. Bias is the automatic shift of a system's interchange schedule with frequency. The basic function of modern frequency and tie line control is that of regulating total generating output in each individual system or control area in such a way that the total generation will match continuously and as closely as possible the total system load, including scheduled load on interconnection ties.

Frequency never remains at 60 cycles—it is always a bit above or a bit below, because the loads are always fluctuating and the generation follows to keep the system load and generation in balance and as close to 60 cycles as possible. Although deviations in frequency almost always occur due to the impossibility of matching instantaneous load variations with rapid changes in generation, it is important for system operation to keep these frequency deviations as small as possible.

The magnitude of the change in instantaneous generation and frequency on an interconnected system will tend to diminish as the distance from the point of

load change increases. But a load change at any point will have an effect on the instantaneous generation and frequency at every point on the interconnected system. These effects can be calculated.

Each generating unit when operating at a speed corresponding to 60 cycles has mechanical energy of rotation stored in its rotating components which is automatically convertible to electric energy when there is a decrease in frequency and a corresponding drop in revolutions per minute. When a load is added suddenly to an electric system or a generator is taken suddenly out of service, assuming no other changes occur, every generating unit operating on the Florida system and all connected systems almost instantly experience a loss in speed, so that the mechanical energy of rotation of every generator is converted to electric energy. The sum total of the electric energy so obtained through the conversion of mechanical energy of rotation supplies part of the new load or takes the place of some of the lost generation. Thus every connected generator on the entire interconnected system contributes energy to the interconnected system to supply part of the additional load and so maintain the balance between total system generation and total system load. Following this initial reaction, the governor on each generator reacts in accordance with its sensitivity, rate of response, and position in relation to its "dead band" (the area within which a governor will not respond to a change in load), causing additional steam to be applied to the turbines and to speed up the generators thus producing more energy, which in turn increases the speed of all generators, bringing frequency back to normal. As these events occur, the tie line bias of all the systems is operating so that the net interchange of each system with its neighbors will tend to

return to the former prearranged level. Because of the tie line bias of each system, the particular system on which the increase actually occurred will eventually increase generation to supply the additional load and the other systems will correspondingly reduce their temporarily increased electric generation.

Changes in load at various points on all systems are constantly occurring, producing changes in frequency throughout all interconnected systems. The resulting changes in generation of electric energy throughout the interconnected systems reduce the range of the changes in frequency and thus improve the efficiency of operation of the interconnected systems. Thus unnecessary speed-up or slow-down in generating equipment is minimized; clocks keep more perfect time; precision industrial operations are improved; and oscillations between generators are reduced. This is accomplished by the dispersal of the immediate effects of load changes throughout the electromagnetically interlocked generators of the interconnected systems. One of the reasons for the interconnection of systems is the ability of such systems to promote stability in generation and frequency by dispersing the effects of load changes throughout larger systems. These effects result in a constant swapping and redistribution of loads borne by the various generators throughout interconnected systems.

These changes are worked through quickly. But they occur. And they occur continuously and frequently.

Thus the modern electric system, such as that of Florida and the systems with which it is interconnected, is an ever varying one; loads and generation are constantly varying from moment to moment as lights are switched on and off and as workmen increase or decrease the power in the machines they use in myriad operations.

For any particular loading on an electric system or interconnected set of systems all of the electric energy produced by all the generating units is delivered to the common coordinated and integrated modern transmission system from which all of the customers are supplied. Variations in load at any point cause changes throughout the interconnected electric systems because of the interdependence of the generating sources. All generating units connected to a common network experience the same changes in frequency and all clocks connected to such a network experience these changes in frequency and maintain the same time.

No attempt is made to control flows in individual lines because the electric energy flows are determined by the electric characteristics of the network. Only the net of flows over all interconnections on a system is controlled by increasing or decreasing generation so as to maintain interconnection schedules and to maintain frequency as closely as possible at 60 cycles. The changes in generation are in response to changes in load and the effects of tie line bias on all the interconnected systems.

The electrical and other characteristics of an electrical network affect the transfers of electric power and energy at points of connection with other interconnected electric systems. The moment to moment distribution of electric power and energy in an electric network is determined automatically by (1) the electric characteristics, namely, resistance, inductive reactance and capacitative reactance of the electric lines and electric facilities; (2) the locations and power outputs of generating units in operation; and (3) the locations of and amounts of power taken by the electric loads. The electric loads on an electric

system vary from moment to moment and so does the total generation. Consequently, the transfers of electric power at points of connection of Florida with other interconnected electric systems vary from moment to moment.

Electric systems, such as Florida, Corp, Georgia, and others normally have no control over the actual transfers of electric power and energy over any particular transmission interconnection with another electric system if there is more than one interconnection. Similarly electric utilities, such as Florida, Corp, Georgia, and others, normally have no control over the actual transfers of electric power and energy with any particular electric system if there are interconnections with two or more electric systems, which are also directly or indirectly connected. In each instance this is due to the free flow characteristics of the electric networks. All that is normally controlled by each system is the net of flows over all its interconnections which is brought about through the effects of tie line bias, frequency changes, governor reactions and generator responses thereto.

Thus there is a free flow of power and energy throughout the electric network in which Corp and Georgia participate. There is also a free flow of power and energy throughout the electric network formed by Corp and Florida. And there is a free flow of energy among Georgia, Corp, and Florida.

All 140 members of the ISG operate in parallel. All are interlocked electromagnetically and maintain the same frequency. Each member renders automatic assistance to the other in times of emergency. As previously noted, Florida can receive from or contribute to ISG up to 100 mw. The network formed by all the members of ISG and the tie line bias and frequency

control used by member systems provide mutual assistance in maintaining standard 60-cycle frequency, thereby improving the efficiency of operation of all.

Electric systems operating together on an interconnected basis, such as Florida, Corp and Georgia, schedule the amounts of power and energy transactions among themselves on an hour-to-hour basis and each sets on its own net interchange controller the net amount of scheduled transactions. Each system measures the actual transfers at each point of connection with another electric system and the differences between scheduled transactions and actual transfers are balanced out as soon as practical. In order that the technique may work efficiently all interconnected systems must do their share in adhering to schedules as closely as possible.

In actuality there are substantial differences between the scheduled and actual transactions. The reason is that none of the connected electric systems including that of Florida, Corp, and Georgia has any control over the actual transfers of power at each point of interconnection because of the free flow characteristics of electric networks. All that can be controlled on each system having more than one interconnection with other electric systems is the net of transfers into or out of its own system or area. This is particularly so with respect to the electric system of Florida because some of the electric systems to which it is connected have connections among themselves.

An electric utility system such as Florida is essentially an electro-mechanical system to which all operating generators on the interconnected network are interlocked electromagnetically. This means that electric generators, under ordinary operating conditions,

run either at exactly the same speed or at speeds which will result in a frequency of 60 cycles. No operating generator can change its speed by itself as long as it operates connected to the network. All generators connected to the same network must follow each other as to speed and frequency whenever there is a change in frequency, and the frequency of all interlocked generators is always exactly the same.

The electric systems of Florida and all other interconnected systems are essentially alike as to electrical, electromagnetic and electromechanical characteristics. Because they are alike, it is possible to have presently existing interconnected operations on a very large scale, extending from the Rocky Mountains to the Atlantic Ocean and from the Canadian to the Mexican border.

For all practical purposes electric energy in the form of alternating current is generated as needed because it cannot be stored in electrical form. At any point in time such electric energy is delivered where needed on a system at a speed of about 186,000 miles per second. An interconnected electric system such as that of Florida, Corp, Georgia, and the others to which it is interconnected, automatically requires at constant frequency that at every moment total generation always be equal to total load plus losses; otherwise, there is an unbalance causing a change in frequency. An electric system cannot supply one connected load and not supply another connected load. For any particular loading on an electric system, all of the electric energy produced by all of the generating units is delivered to the common transmission network which acts as a single unit from which all of the customers are supplied. For any change in load or generation, there is an electrical effect through a

change in voltage and current at all generators and at all loads.

If a housewife in Atlanta on the Georgia system turns on a light, every generator on Florida's system almost instantly is caused to produce some quantity of additional electric energy which serves to maintain the balance in the interconnected system between generation and load. If sensitive enough instruments were available and were to be placed throughout Florida's system the increase in generation by every generator on Florida could be precisely measured.

Nobody can say for certain just how electricity is really transmitted. The analogy to a flow of water is metaphorical only. Does an electron move from one end of a thousand mile wire to another? Or is there only interaction between neighboring electrons or between fields of force? The answer is not important for legal purposes. The significant factors are that Florida's generators are interlocked electromagnetically with Georgia's and that in consequence, Florida's generators increase their production of electric energy almost instantaneously and automatically in response to increases in load on Georgia's system thereby contributing in some measure to the system supply which meets the increased Georgia load, reducing the variation in frequency on the Georgia system, and increasing its efficiency of operation. Without the Florida response the electric reactions on Georgia and the interconnected systems would be different.

The cause and effect relationship in electric energy occurring throughout every generator and point on the Georgia, Corp and Florida systems constitutes interstate transmission of electric energy by, to, and from Florida. It is the electromagnetic unity of re-

sponse of Florida, Corp, Georgia and other interconnecting systems that constitutes the interstate transmission of electric energy by Florida.

V

QUANTITY IMMATERIAL

It is settled law that the quantity of interstate energy transmitted is immaterial in determining whether there is interstate transmission for jurisdictional purposes, *Hartford Electric Light Company* v. *F.P.C.*, 131 F. 2d 953, 960 (CA2), cert. denied, 319 U.S. 741. *Wisconsin Michigan Power Co.* v. *F.P.C.*, 197 F. 2d 472, 478 (CA7–1952), cert. denied, 345 U.S. 934.

VI

TRACING: ITS LIMITATIONS AND PREFERRED METHOD

In the preceding portion of this decision it has been found that Florida transmits interstate electric energy. The conclusion is based on cause and effect relationships that are interstate in scope. No effort is made to trace the path of the interstate electric energy.

The nature of electric energy is not clearly understood. It is sometimes described as a field of force or as a jostling motion of electrons. Where electric energy from two sources has combined, there is no way to identify a particular portion with a particular source. Electric energy is unlike a liquid, gas or solid, whose path can be traced by methods such as, dyeing one stream of the liquid, chemical analysis, tracing radioactive atoms.

In certain simple situations it can be proved that electric energy, or at least an undivided part of the

whole, comes from a particular source. Thus a load of 100 kw, C, is supplied from a bus [2] which receives 50 kw from each of two sources, A and B. Plainly the load is receiving electric energy from both A and B. The proof here is logical or mathematical. It does not involve knowledge or application of the physics of electric energy. That the energy at C comes from both A and B is both a sufficient and a necessary explanation. However in modern electric systems such as those of Florida, such methods of logical analysis of the raw data are not applicable. There is too much commingling from different sources in the buses, and the systems are so complex that there are many possible sources which could account for the amount of electric energy at any point. In these circumstances, several explanations may be sufficient but none may possess the uniqueness necessary for proof.

The principal parties to this proceeding presented their case by attempting to prove or disprove the interstate transmission of electric energy between Florida and Georgia by tracing the flow of electric energy. The Staff relied on the commingled method, Florida on the systems study method. On the basis of the commingled method, it can be proved that electric energy is transmitted between Florida and Georgia; on the basis of the systems study method the contrary follows.

What both Staff and Florida do by their respective methods is transpose the complex dynamism of modern alternating current electric systems into simplified models on the basis of numerous assumptions. The

[2] The ordinary three phase bus is a set of three bars which conduct electric energy and to which incoming circuits lead and from which outgoing circuits extend. It is used as a junction to which supplies of electric energy are joined or from which electric energy is divided to supply different loads.

crucial difference between the two methods lies in their treatment of a bus and what happens in the bus.

Florida's system studies method treats the bus as having physical dimensions. It replaces each three phase alternating current bus structure by a single conductor bus and uses the point to point tracing principles of direct current circuits with static power sources and with steady state power flows. The method treats the power flow through the bus as constant in value and direction, on the basis that balanced three phase power under steady state conditions is constant in value and direction from instant to instant, and even with some unbalance, the instantaneous three phase power varies only slightly from the average value and does not change direction. Thus in the systems studies method, the flow of electric energy instant by instant in the bus is treated as constant in magnitude and as being in a single direction. This result is achieved by taking the algebraic sum of the magnitudes and directions of each of the three power phases and using the combined value of three phase power as representative of the power flow.

This unidirectional combined value of three phase power is purely a mathematical concept. In reality there is no such thing as three phase power. The physical reality is that there are power flows in two directions in each of the three phases, and that both the direction and magnitude of the power in each phase change from instant to instant. The use of a combined power value moving in a single direction to represent all the power being supplied to the bus conceals the dynamics of the physical phenomena. And it is the physical reality that is of significance for purposes of this case.

Staff's method of treating the bus as a point, a tank or a reservoir, where all the energy supplied

to the bus is commingled, more nearly represents an actual three phase electric power system because it, in effect, allows for the differences, instant to instant, among the electrical characteristics of sources of power supply and loads, and provides for power contributions to electric loads more nearly as they actually take place. It furnishes a more satisfactory explanation for purposes of this proceeding because it is more in consonance with the physics of transmission of alternating current than the combined constant value unidirectional assumption underlying the systems study method.

The systems studies method is used for certain types of engineering studies. For these purposes the use of unidirectional combined values is satisfactory because all that is desired is a mathematical answer regardless whether it is in consonance with the physical dynamics of the situation. The combining of magnitudes and directions is similar to the technique of averaging. Both are meaningful methods of representing certain aspects of data. Thus average per capita income can be a useful concept. But on the basis of average per capita income, there are no poor in the United States. The average is not fully descriptive of the reality, which is a range of incomes from poor to rich. Similarly, the combining of magnitudes and direction of each of the three phases does not provide an adequate description of the dynamic phenomena that occur in a three phase bus which serves as a junction for numerous three phase lines.

If tracing is required then the commingled method with its assumptions reflects the physical reality of alternating current systems better than the systems studies method with its assumptions. On the basis of the commingled method of treating the bus as a point,

a tank or a reservoir, the transmission of electric energy between Georgia and Florida via Corp can be demonstrated.

VII

FLORIDA NOT WITHIN LOCAL DISTRIBUTION EXEMPTION

Interstate transmission of electric energy as used in the Federal Power Act was expected to encompass the almost instantaneous electromagnetic reaction throughout interconnected systems. It was realized that generation at any point on interconnected interstate electric systems would tend to result in an electric response throughout connected facilities even to the final consumer. But Congress did not desire to extend federal regulation to local distribution systems. It therefore included in Section 202(b) an exemption from federal jurisdiction over facilities used in local distribution. But for this exemption FPC's jurisdiction over the interstate transmission or sale of electric enegy would have extended to the local wholesale purchaser and his distributing system. In other words a physical test was first adopted as the standard for interstate electric transmission. But because of the recognition that such a physical standard would by virtue of the technology of electric transmission tend to extend FPC jurisdiction over all interconnected local distribution facilities, Congress found it necessary to limit FPC's jurisdiction by superimposing a legal test: FPC shall not exercise jurisdiction over local distribution facilities.

The reach of interstate transmission is indicated by the Supreme Court in *Connecticut Light & Power Company* v. *F.P.C.*, 324 U.S. 515, at 529–530 (1945):

> * * * This bill [The genesis of Part II of the Federal Power Act] came before Congress

> as prepared by the staff of the Commission, couched largely in the technical language of the electric art. Federal jurisdiction was to follow the flow of electric energy, an engineering and scientific, rather than a legalistic or governmental, test. Technology of the business is such that if any part of a supply of electric energy comes from outside of a state it is, or may be present in every connected distribution facility. Every facility from generator to the appliance for consumption may thus be called one for transmitting such interstate. By this test the cord from a light plug to a toaster on the breakfast table is a facility for transmission of interstate energy if any part of the load is generated without the state. It has never been questioned that technologically generation, transmission, distribution and consumption are so fused and interdependent that the whole enterprise is within the reach of the commerce power of Congress, either on the basis that it is, or that it affects, interstate commerce, if at any point it crosses a state line * * *

Aware of the reach of interstate transmission of electric energy, the Court explained that Congress had imposed an express limitation on FPC's jurisdiction in the form of a separate legal test (324 U.S. at 531):

> * * * To define the scope of state controls, Congress employed terms of limitation perhaps less scientific, less precise, less definite than the terms of the the grant of federal power. The expression "facilities used in local distribution" is one of relative generality. But as used in this Act it is not a meaningless generality in the light of our history and the structure of our government. We hold the phrase to be a limitation on jurisdiction and a legal standard that must be given effect in this case in addition to the technological transmission test * * *

What is the scope of the local distribution exemption? Local distribution begins where high voltage bulk power is reduced to low voltage for the wholesaler who distributes to the local consumer. Thus the Supreme Court stated in *United States* v. *Public Utilities Commission of California*, 345 U.S. 295 at 316:

> * * * The sales were made in California but the facilities supplied "local distribution" only after the current was subdivided for individual consumers. * * *

The same application of the local distribution test was made in *Wisconsin Power Co.* v. *F.P.C.*, 197 F. 2d 472 (CA7–1952), cert. denied, 345 U.S. 934, where the Court stated (197 F. 2d at 477):

> * * * The question is essentially, when does interstate commerce transportation end and where do the local distribution facilities first become operative. We have seen that the power is transmitted from state to state. In the Wisconsin operation, it comes to Stiles in that state by means of the main transmission line from Michigan and there a transformer reduces it in voltage. It then proceeds in transmission over the lower voltage line to still other points where again the voltage is reduced; eventually it comes to the plants of the wholesalers. Thus the interstate transmissions of electric energy continues from Michigan through the transformers in reduced voltage to the wholesaler; upon delivery to him local distribution begins when he resells. His sales and distribution at retail are clearly local in character, and constitute only local distribution; but at no point before delivery to him has been completed, has interstate transmission terminated. In other words "facilities used in local distribution" means facilities used for making resale and distribution to consumers, jurisdiction over which

> is left to the states * * * We think there is no ground for the position that local distribution includes any transmission occurring before the wholesaler who resells at retail is reached * * *

Florida has a transmission grid of 2,500 miles, of which 1,400 are high voltage, 115 kv or above. There are 1,100 miles of transmission facilities used for local distribution. The 1,400 miles of high voltage lines are anterior to distribution to local consumers and are not "facilities used in local distribution."

In *Connecticut Light & Power Co., supra*, the facility of Connecticut Light on which jurisdiction was claimed to rest was a step-down transformer at the Company's substation at Bristol, an isolated segment of its system. The distribution facilities from the Bristol substation to individual consumers were concededly within the local distribution exemption. A connecting system which received some interstate power had an extension which supplied the power to the Bristol substation which reduced the voltage prior to distribution to the consumers. The step-down transformer in the substation was the only facility of Connecticut Light that did not plainly fall within the local distribution exemption. The Supreme Court remanded the case to the Commission to determine whether the transformer performed the last stage in interstate transmission or the first stage in local distribution. In the instant case there is no such problem. Florida's 1,400 miles of high voltage transmission lines are used to transport bulk power and are not part of the facilities used to distribute the power to local consumers. Florida therefore has facilities which are not within the local distribution exemption, and which transmit interstate electric energy.

VIII

EXERCISE OF JURISDICTION

As a public utility under the Act, Florida would be required to keep its accounts in accordance with the Commission's Uniform System of Accounts for Public Utilities. Florida presently files the Commission's principal reports, FPC Form No. 1, Annual Report, and No. 12, Power System Statement. It maintains its books of account in accordance with the NARUC (National Association of Railroad and Utilities Commissioners) system of accounts which are similar to those of the Commission's Uniform System of Accounts. Florida reclassified its plant accounts for the Securities and Exchange Commission in 1942 on an original cost basis. It has been keeping its accounts on that basis at least since 1951. So conforming to the Commission's accounting requirements would not be burdensome.

A second factor is the Commission's jurisdiction over the interconnections of public utilities. A facet of this problem is illustrated by the situation regarding the Intervenor City of Clewiston.

Clewiston is three miles from Florida's Ranch-Fort Myers transmission line. Clewiston owns and operates its own distribution plant. It presently purchases its electric supply from U.S. Sugar Corporation, which in turn purchases Clewiston's requirements from Glades Electric Cooperative, Inc. Glades purchases its power from Florida three miles from Clewiston. Clewiston seeks to purchase directly from Florida. Direct service to Clewiston by Florida would save the City $100,000 per year.

In 1952 Clewiston and U.S. Sugar sought jointly to obtain power for the summer months. Florida stated its willingness to sell power to U.S. Sugar, but was

not willing to permit the power to be resold to Clewiston.

In 1954 Clewiston requested direct service from Florida at wholesale. This was refused on the grounds that this was contrary to company policy, that it would not sell to a municipal at wholesale except in the case of furnishing an emergency supply. As an alternative, Florida proposed to lease Clewiston's distribution system and sell directly at retail within the City. This counterproposal was rejected by the City Commission.

In 1957 Clewiston again requested that Florida sell directly to it. Florida stated in essence that Clewiston's request was rejected, but that it would be willing to buy out the system and sell at retail within the City. The City turned down this counter-offer, and, as a result, was unable to purchase power from Florida. At this conference, Florida restated the same company policy as was stated in the 1954 negotiations.

In 1962 Clewiston again requested a direct power supply from Florida. Florida stated, in essence, that its policy had not changed and it would therefore not sell to Clewiston at wholesale.

In July 1965 Clewiston requested a direct wholesale supply from Florida at the same rates as Florida was using for its sales to Glades, the rural electric cooperative which was reselling Florida power to U.S. Sugar which in turn was selling to Clewiston. Florida stated in essence that the company policy had not changed, and that it would not sell to Clewiston.

In a September 1965 conference Florida's president stated in essence that the company policy regarding selling power to municipalities had not changed, but could change. He would propose to Florida's Board of Directors that if the City of Clewiston would agree to have a referendum to see if the City would sell its

distribution system to Florida or should continue to operate it, and the City Commission would be bound by this referendum, Florida would sell directly to the City if the referendum vote were in favor of City ownership. Florida also stated, in essence, that the rates would not necessarily be as low as the rates to Glades, and that this would have to be worked out. Clewiston informed Florida that if Florida would submit a written proposal it would be presented to the City Commission for appropriate action.

If Florida be held to be a public utility, the Commission has power under Section 202(b) of the Act to direct that it interconnect with Clewiston if, after hearing, it finds this to be in the public interest and not an undue burden upon Florida. Clewiston in Docket No. E-7243 filed an application for such action; however on July 6, 1966, 36 FPC 17, the Commission granted a motion by Clewiston to dismiss this proceeding on the grounds that pursuant to an agreement among Glades, Clewiston and U.S. Sugar, Glades will sell directly to Clewiston at rates representing a reduction of $140,000 from the rates Clewiston formerly paid to U.S. Sugar. This result apparently satisfies Clewiston's immediate objectives. But it does not dismiss the matters and principles raised by Clewiston in the instant proceeding. A finding of jurisdiction herein would enable the Commission to take action with respect to similar problems if they should arise and if such a step should be found appropriate.

Another aspect of the interconnection problem concerns Florida's participation in ISG and its interconnection with 140 electric utility systems throughout the southern and central United States. All these systems operate in parallel and are interlocked electro-

magnetically. All are interdependent to some extent. The Northeast Power Failure of 1965 suggests the reach of such interdependence. It is expedient that FPC's exercise of jurisdiction which it is otherwise found to possess under the Act be in consonance with the reach and realities of modern interconnected electric systems.

IX

CONCLUSION

It is further found and concluded:

(1) Florida Power & Light Company, a corporation organized and existing pursuant to the laws of the State of Florida, owns and operates facilities, among others, for the transmission of electric energy transmitted from points of generation in the States of Georgia and Florida to points of consumption outside the State in which it is generated, which facilities are in addition to, and do not include, facilities used for the generation of electric energy, facilities used in local distribution or only for the transmission of electric energy in intrastate commerce, or facilities for the transmission of electric energy consumed wholly by the transmitter.

Florida Power & Light Company is, therefore, a public utility within the meaning of that term as used in Section 201 of the Federal Power Act and subject to the jurisdiction of the Commission.

(2) Florida Power & Light Company, as a public utility under the Federal Power Act, is obligated, *inter alia,* to file with the Federal Power Commission original cost statements in the manner provided in Section 120.3 of the Commission's Regulations under the Federal Power Act and Electric Plant Instruction No. 1 of the Commission's Uniform System

of Accounts Prescribed for Public Utilities and Licensees Subject to the Provisions of the Federal Power Act.

ORDER

WHEREFORE, *It is ordered* that within ninety days from the date of this decision, Florida Power & Light Company comply with all requirements of the Commission's Regulations under the Federal Power Act, including the Uniform System of Accounts Prescribed for Public Utilities and Licensees Subject to the Provisions of the Federal Power Act.

SEYMOUR WENNER,
Presiding Examiner.

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1970

No. ~~956~~ 70-38

FEDERAL POWER COMMISSION, *Petitioner*

v.

FLORIDA POWER & LIGHT COMPANY

ON PETITION FOR A WRIT OF CERTIORARI
TO THE UNITED STATES COURT OF APPEALS
FOR THE FIFTH CIRCUIT

MOTION FOR LEAVE TO FILE AMICUS CURIAE AND BRIEF OF GAINESVILLE UTILITIES DEPARTMENT AND CITY OF GAINESVILLE, FLORIDA

GEORGE SPIEGEL
JAMES F. FAIRMAN, JR.
2600 Virginia Avenue, N.W.
Washington, D.C. 20037

MELVIN RICHTER
1001 Connecticut Avenue, N.W.
Washington, D.C. · 20036

Attorneys for Amicus Curiae

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IN THE

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OCTOBER TERM, 1970

No. 958

FEDERAL POWER COMMISSION, *Petitioner*

v.

FLORIDA POWER & LIGHT COMPANY

ON PETITION FOR A WRIT OF CERTIORARI
TO THE UNITED STATES COURT OF APPEALS
FOR THE FIFTH CIRCUIT

MOTION FOR LEAVE TO FILE BRIEF AMICUS CURIAE

Gainesville Utilities Department and the City of Gainesville, Florida (Gainesville), hereby respectfully move for leave to file the accompanying brief in this case as *amicus curiae* in support of the petition for certiorari filed by the Federal Power Commission in the above captioned proceeding. The Solicitor General has consented to the filing of the brief, but the attorneys for respondent, Florida Power & Light Company (FPL), have refused consent.

The City of Gainesville owns an electric generating transmission and distribution system located in Alachua County, Florida. This system, which is operated by Gainesville Utilities Department, serves some 22,000 customers within and

outside the City in competition with Florida Power Corporation. Since Gainesville has been operating in isolation with a rapidly growing load, entry into the Florida power pool in which FPL is the largest member would be highly beneficial to the public served by Gainesville by making available to it the many and valuable benefits available through such pool operation.

Prior to the filing of the complaint which culminated in the Commission's decision in *Gainesville v. Florida Power Corp.*, 40 FPC 1227, reversed in part, 425 F.2d 1196 (5th Cir., 1970), pending on writ of certiorari, No. 464 this Term, Gainesville sought to obtain such access through interconnection with FPL. However, FPL was unwilling voluntarily to interconnect with Gainesville. Accordingly, since FPL had not yet been found to be a "public utility" subject to Commission regulation under the Federal Power Act, Gainesville by complaint filed with the Commission sought interconnection with Florida Power, an admitted "public utility" under the Federal Power Act.

Even should this Court in No. 464 reinstate the terms and conditions prescribed by the Commission in directing Florida Power to interconnect with Gainesville, Commission jurisdiction over FPL would still be of vital concern to Gainesville. Not only may further Commission action be required in order to obtain appropriate participation for Gainesville in the Florida pool, but Gainesville's relation with FPL within the pool may call for Commission supervision. In any case, quite apart from the Florida pool itself, Gainesville's close proximity to FPL lines makes it highly desirable for Gainesville also to interconnect and operate in coordination with FPL; and Gainesville's past experience strongly indicates the need for an exercise of Commission jurisdiction in order to bring even a limited interconnection between FPL and Gainesville into being.

Gainesville, thus, has a vital interest in the question whether FPL is a public utility under the Federal Power Act presented by the Commission's petition herein. Gaines-

ville, therefore, respectfully requests the Court to grant it leave to file the attached brief *amicus curiae* in support of the Commission's petition for writ of certiorari.

Respectfully submitted,

GEORGE SPIEGEL
JAMES F. FAIRMAN, JR.
2600 Virginia Avenue, N.W.
Washington, D.C. 20037

MELVIN RICHTER
1001 Connecticut Ave., N.W.
Washington, D.C. 20036

Attorneys for Amicus Curiae

November 1970

IN THE

Supreme Court of the United States

OCTOBER TERM, 1970

No. 958

FEDERAL POWER COMMISSION, *Petitioner*

v.

FLORIDA POWER & LIGHT COMPANY

ON PETITION FOR A WRIT OF CERTIORARI
TO THE UNITED STATES COURT OF APPEALS
FOR THE FIFTH CIRCUIT

BRIEF OF GAINESVILLE UTILITIES DEPARTMENT, CITY OF GAINESVILLE, FLORIDA, AS AMICUS CURIAE

By leave of this Court, Gainesville Utilities Department and the City of Gainesville, Florida (Gainesville), file this brief as *amicus curiae* prior to the consideration of the petition for writ of certiorari of the Federal Power Commission in the above-captioned proceeding.

INTEREST OF AMICUS CURIAE

As set out in the attached motion, Gainesville has a vital interest in the status of Florida Power & Light Company

(FPL) under the Federal Power Act even should this Court in No. 464 reinstate the terms and conditions prescribed by the Commission in directing Florida Power to interconnect with Gainesville. Not only may Commission action still be required for Gainesville to obtain appropriate participation in the Florida pool in which FPL is the largest member, but Gainesville's relationships with FPL within the Pool may call for Commission supervision. In any case, quite apart from the Florida pool itself, it would be in the public interest in light of Gainesville's close proximity to FPL lines, for Gainesville to interconnect and operate in coordination with FPL.

ARGUMENT

In this case, the Commission has found that FPL, although wholly located within the State of Florida, transmits power in interstate commerce and hence is a "public utility" subject to Commission regulation under the Federal Power Act. The Fifth Circuit has set aside that determination, and the Commission's petition for a writ of certiorari demonstrates, we submit, that review by this Court is fully warranted. While we adopt in substance the Commission's petition, we believe that the following additional considerations serve to reinforce the Commission's petition:

1. The holding below fails to take into account that, as pointed out by the Commission (Pet. App. C, p. 47), FPL has been operated in such a way as to receive "substantial benefits from its participation in the Florida pool in the coordination of spinning reserves, the assurance of reliability of frequency control and from both the Florida Pool and ISG[1] in the form of automatic assistance in the case of

[1] Interconnected Systems Group, consisting of 140 interconnected utilities spanning the southeastern and central portions of the United States (Pet. App. C, p. 42).

emergencies."[2] The extent of FPL dependence on Florida Pool and ISG is indicated by the minimal level of FPL's reserve as reported by the Commission's Bureau of Power (Preliminary Report on Winter 1970-1971 Load Supply Situation (p. 4)):

> "Overall the Florida Power Pool appears to have satisfactory reserves. One member, Florida Power and Light Company is short of reserves with projected 392 mw or 7.5 percent reserve margin. Due to transmission limitations only limited help could be brought into the area should plants in the Miami area suffer high forced outages."

2. The approach of the Court below is also patently inconsistent with those of the Sixth, Seventh and Eighth Circuits in *Public Service Co. of Indiana Inc. v. FPC*, 375 F.2d 100 (7th Cir. 1967), *cert.* denied, 387 U.S. 931; *Cincinnati Gas & Electric Co. v. FPC*, 376 F.2d 506 (6th Cir. 1967), *cert.* denied, 389 U.S. 842; *Indiana & Michigan Electric Co. v. FPC*, 365 F.2d 180 (7th Cir. 1966), *cert.* denied, 385 U.S. 972; *Arkansas Power & Light Co. v. FPC*, 368 F. 2d 376 (8th Cir. 1966).

The Commission in this case has placed heavy reliance upon its findings with regard to "electromagnetic unity".[3] As found by the Commission, subject to the limitation of the interconnections, the power generated by FPL moves in interstate commerce as a result of "electromagnetic unity" with the 140 interconnected utilities making up ISG under which the generating units of the interconnected companies

---

[2] Although the assistance available to FPL from ISG is limited by the 100 mw capacity of the interconnection, 12 of FPL's 24 generating units generate 75 mw or less and the emergency outage of any one of these units would automatically bring assistance to FPL (see Pet. App. C, p. 42).

[3] As noted in the Petition (at pp. 7-8), the Commission's finding that FPL transmitted power in interstate commerce is also based on the application of the commingling method of tracing (see Pet. App. D, pp. 80-82).

are synchronized and operated in parallel; those generating units, accordingly, are all interlocked electromagnetically with the result that the addition of a load on one part of the system simultaneously affects every generating unit in the system (Pet. App. C, pp. 42-43; App. D, pp. 70-79). The Fifth Circuit brushed these findings aside as inadequate and inconclusive, ruling that (Pet App. A, pp. 23-24):

> "* * * the complex relationship of cause and effect in interconnected and synchronized systems is, as to FPL, not sufficient to prove the actual transmission of energy interstate. It tells us what, as to that company, could occur. It does not tell us with any substantial degree of certainty what does occur."
>
> * * * * *
>
> "* * * The Commission referred * * * to FPL's contribution of 8 mw to ISG during an outage in the midwest. The 'contribution' does not necessarily mean that power was transmitted interstate from FPL to the midwest. Although the effect of FPL's transmission was to increase the total wattage available to the whole system, the 'electromagnetic unity of response' theory is equally compatible with either the Commission's 'permeation' assumption or the hypothesis that the power transmitted by FPL was consumed by Corp, another eight mw being passed on by Corp for further use or transmission."

In contrast, in the *Indiana & Michigan* case, the Seventh Circuit, after explaining—in terms closely paralleling those of the Commission and Examiner here—that as an ISG member, the Company's generators operated in electromagnetic unity with those of other ISG members, the Seventh Circuit ruled (365 F.2d at 184).

> "The unpredictable and free-flow of energy in the System in response to any number of constantly changing occurrences, makes it certain, in the view of the Federal Power Commission that out-of-state energy received by I&M at a number of points at or near its eastern, southern or western borders, at one time

or another, reaches each of I&M's wholesale customers.

"We hold the Commission was justified, based upon expert opinion evidence and otherwise, in holding the sales by I&M to its wholesale customers were in interstate commerce and were subject to the jurisdiction of the Federal Power Commission.

* * * * *

"'We reject I&M's fundamental proposition in this case that in order to prevail, the Federal Power Commission must do what I&M claims to be impossible, that is, to prove by either tracing or some other unnamed 'scientific and engineering proof' that out-of-state energy reaches the wholesale customers. We might recall that even in criminal cases, guilt beyond a reasonable doubt often can be established by circumstantial evidence."

And, in *Public Service of Indiana*, where the Company again was an ISG member and the Commission found, in terms very similar to those in the instant proceeding, that the Company's generators operated in electromagnetic unity with those of the other ISG members (see 34 FPC 1513, 1515-1516), the Sixth Circuit held (375 F.2d at 102-103):

"The ultimate finding of the Commission upon which it asserted jurisdiction is substantially that PSCI's interconnections with other public utilities locates it in a 'large power pool' from which PSCI receives 'large quantities' of out-of-state energy resulting in 'pool sales' subject to Commission regulation.

"PSCI contends that there is no substantial basis in the record for the conclusion that its sales were in interstate commerce because the Commission did not employ point-to-point tracing studies as in many previous cases. The Commission's test, it argues, was an arbitrary nonscientific 'power pool' test, instead of the 'engineering and scientific' test stated by the Supreme Court in Connecticut Light & Power Co. v. FPC, 324 U.S. 515 * * * (1945), and F.P.C. v. South-

ern Cal. Edison Co., 376 U.S. 205 * * * (1964) (the *Colton* case) * * *.

* * * * *

* * *"We are not persuaded that *Colton* and *Connecticut* are applicable to rule out use by the FPC of the so-called 'power pool' test on the record before us. Scientific evidence can be circumstantial as well as direct.

"The use of the 'power pool' test was approved in both Indiana & Mich. Elec. Co. v. F.P.C., 365 F. 2d 180 (7th Cir. 1966) (I&M), cert. denied, 385 U.S. 972, 87 S. Ct. 509, 17 L.Ed.2d 435 (Dec. 6, 1966), and Arkansas Power & Light Co. v. F.P.C., 368 F.2d 376, 8th Cir., Nov. 7, 1966. In I&M, this court said: 'We think the Commission in holding that the important consideration in determining jurisdiction here is the integrated interstate pool character of the operation.' 365 F.2d at 184. And in *Arkansas*, the court said it was not prepared to say that 'detailed tracing studies are a sine qua non' to federal jurisdiction, where there is an interstate 'pool assist' operation."

The Court below would distinguish these cases primarily on the ground that they involved Commission jurisdiction over sales for resale, whereas here the Commission's assertion of jurisdiction is only over transmission by FPL. But this factual difference does not have the legal consequences asserted by the Court below. In both situations, the basic issue concerned the existence of "interstate commerce" within Section 201(b) of the Federal Power Act. Patently, the principles in which the Courts found interstate commerce in the *Indiana & Michigan* line of cases are also pertinent to the determination whether FPL's transmission of power here is in interstate commerce.

The invalidity of the Court's distinction is further evident from this Court's decision in *FPC v. East Ohio Gas Co.*, 338 U.S. 464 (1950). In affirming in that case the Commission's holding that a company which transported within a single

state, but did not sell for resale, gas moving in interstate commerce was subject to its jurisdiction under the parallel provision of the Natural Gas Act, this Court noted (*Id.* at 468):

> "As we pointed out in Panhandle Eastern Pipe Line Co. v. Public Service Comm., 332 U.S. 507, 516, * * * § 1(b) made the Natural Gas Act applicable to three separate things: '(1) the transportation of natural gas in interstate commerce; (2) its sale in interstate commerce for resale; and (3) natural gas companies engaged in such transportation or sale.' *And throughout the Act 'transportation' and 'sale' are viewed as separate subjects of regulation. They have independent and equally important places in the Act.*" (Emphasis supplied.)

3. The question presented by the Commission's petition is important not only because of its impact upon the means available to it for determining the scope of its own jurisdiction (Pet., pp. 10-12), or because of its bearing on the status under the Federal Power Act of FPL which, in addition to being the largest electric utility in Florida, ranked ninth nationally in 1965 in revenues, fourteenth in investments in gross electric utility plant, and sixteenth in kilowatt hour sales (see Pet. App. C, pp. 39-40). It is also important because in effect it determines whether the Commission may order FPL to interconnect with others, particularly municipally-owned utilities in Florida, as provided in Section 202(b) of the Federal Power Act.

Throughout its National Power Survey (1964), the Commission repeatedly noted (particularly, p. 170, *et seq.*) that interconnection and coordination among electric utilities are highly desirable and to be fostered at all levels and at every opportunity since they open the way for many and valuable benefits, not the least of which arise from reduced overall generating requirements and lower unit costs achievable in the planning and construction of new facilities. Indeed, "[p]articipation of the small systems in the benefits of coordination and a continuous search for means of broadening this participation are fundamental if these systems are

to continue to provide low cost power to their consumers and make the most efficient use of our fuel and capital resources." (Survey, p. 267)

Because of the unique peninsular nature of Florida, the small Florida utilities are peculiarly dependent for interconnections and coordination upon other utilities in Florida, in particular upon FPL, whose operations extend along most of the Florida east coast. As pointed out by the Commission (Pet. App. C, p. 49):

> "As the largest electric utility in the State of Florida, and as one of the major electric utilities in the United States, FPL's importance in insuring the increased reliability of interconnected power systems in Florida and in adjoining states is self-evident."

In contrast, FPL has in the past declined voluntarily to sell power to any municipal utility in Florida. An example of this is the case of Clewiston, intervenor before the Commission, as described in the findings of the Hearing Examiner (Pet. App. D, pp. 87-89).[4] Located only three miles from FPL transmission lines, five times it requested a direct connection and service and each time was refused. Moreover, FPL sought to utilize Clewiston's need to effect a take-over by FPL of Clewiston's system. The Examiner found that it was "contrary to company policy" to "sell to a municipal at wholesale except in the case of furnishing an emergency supply" (Pet. App. D, p. 88).

This policy is also reflected in FPL's reluctance to interconnect and exchange power with municipal systems, such as Gainesville. In testifying in opposition to a bill which would have amended the Federal Power Act to eliminate,

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[4] Clewiston's complaint case against FPL was settled by a settlement eliminating one of the two middlemen between Clewiston and FPL and reducing Clewiston's cost of purchased power by about 30%. Pet. App. C, p. 37, fn. 1; see also, *City of Clewiston v. Florida Power & Light Co.*, 36 FPC 17 (1966).

inter alia, FPC jurisdiction over FPL, the representative of the Florida Municipal Utilities Association[5] pointed out:

> "Mr. Robert H. Fite, president of Florida Power & Light Co., in his prepared statement of June 8, 1967, to this committee emphasized that only 1 percent of the company's revenues is derived from wholesale contracts, and that these are only with REA co-ops.
>
> "The reason for this low percentage is simply because Florida Power & Light Co. refuses to sell wholesale power to municipal utilities within reach of its lines; otherwise there would be a much larger percentage of wholesale sales.
>
> "This policy has forced the municipal utilities to rely upon isolated generating systems, and thus both the municipals and FP&L have been deprived of the advantages of energy exchange, pooling, and coordination." (Hearings before the Committee on Commerce, United States Senate, 90th Congress, 1st Session, on S. 1365, June 1967, Serial No. 90-23, p. 167.)

Finally, review of the holding below is important to eliminate an incentive to FPL (and other utilities in the country) to distort the engineering of their systems in order to escape Commission jurisdiction as permitted by the decision below. Indeed, as if in anticipation of the holding below, FPL, within two months of the Commission's initiation of the instant proceeding, dismantled an interconnection with Florida Power at White Springs, Florida, about twenty miles from the Georgia border, through which Florida Power delivered interstate power received from Georgia Power

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[5]Comprised of the 34 municipal utilities serving over 1,000,000 people, or about 25% of Florida's population.

Company (Tr. 84; see R. 186).[6] As a result of this dismantling, there is a 5-mile gap between the two systems, with the first connection between the two systems at Sanford, Florida, well down the peninsula. Thus, where once the two systems were connected in a loop with power feeding between both systems at either end of their transmission systems, now the FPL line from Sanford to Live Oak dangles as a radial line.

The system map also shows that whereas Florida Power has several interconnections with Georgia Power west of Jennings, Florida, there are no such interconnections with Georgia Power in the area east of Jennings which is served by FPL. Since such lack of interconnection apparently is traceable to FPL's policy to avoid FPC jurisdiction, reinstatement of the Commission holding that FPL is a public utility subject to the Federal Power Act would destroy that reason for FPL's not seeking the interconnections plainly indicated by engineering criteria.

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[6]For the convenience of the Court, we have reproduced in the appendix the system map set out at page 186 of the joint appendix below. Florida Power's lines are those which run southeast from Jasper through Fort White to Sanford. FPL's line run from Sanford through Palatka, Starke, Lake City, and terminate at Live Oak. Near Live Oak the lines of the two systems cross, but do not interconnect.

CONCLUSION

The petition for a writ of certiorari of the Federal Power Commission in this case should be granted.

Respectfully submitted,

GEORGE SPIEGEL
JAMES F. FAIRMAN, JR.
2600 Virginia Avenue, N.W.
Washington, D.C. 20037

MELVIN RICHTER
1001 Connecticut Ave., N.W.
Washington, D.C. 20036

Attorneys for Amicus Curiae

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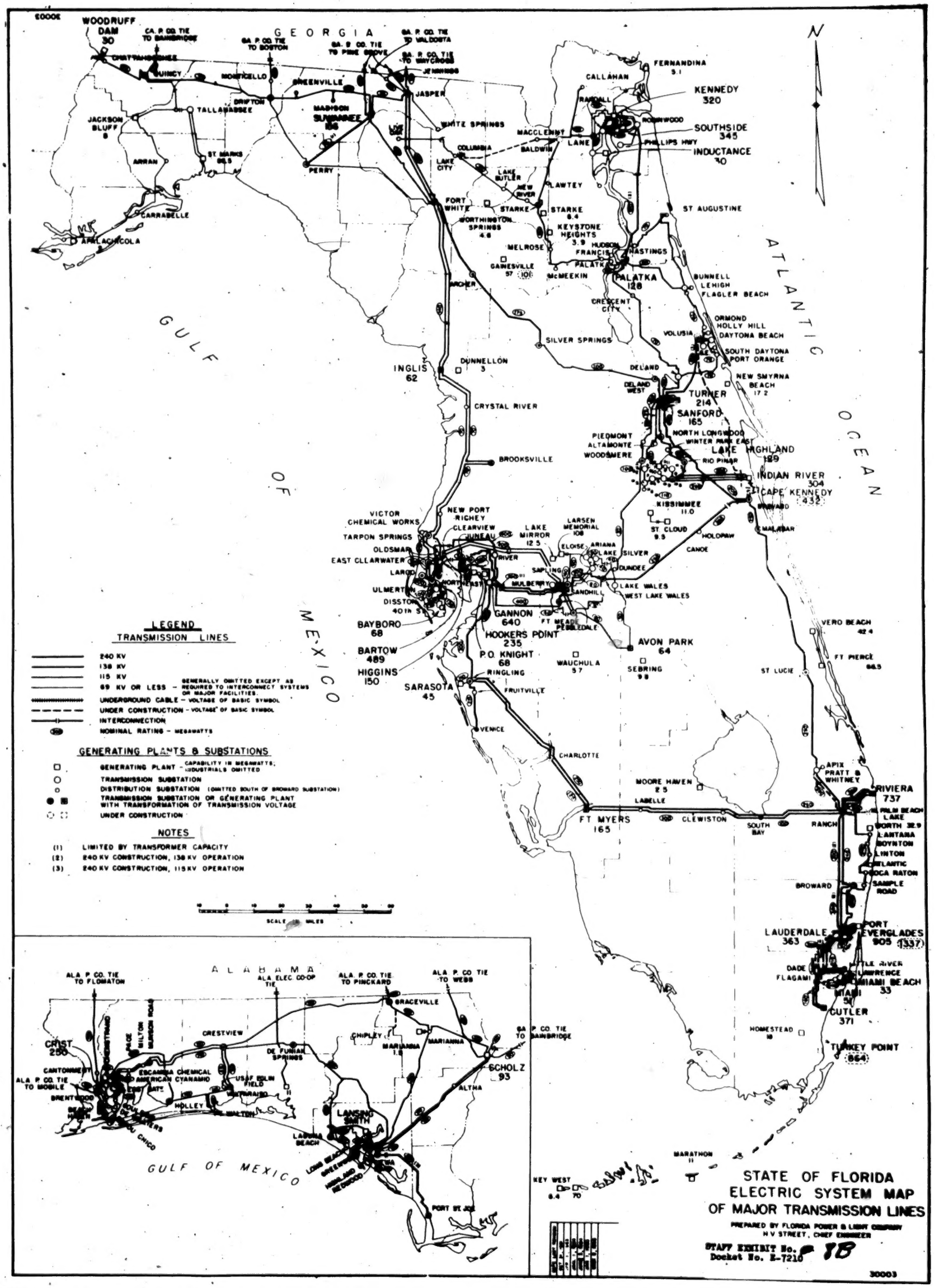
WOODRUFF DAM 30
GEORGIA
ALABAMA
GULF OF MEXICO
ATLANTIC OCEAN
LEGEND
TRANSMISSION LINES
240 KV
138 KV
115 KV
69 KV OR LESS – GENERALLY OMITTED EXCEPT AS REQUIRED TO INTERCONNECT SYSTEMS OR MAJOR FACILITIES.
UNDERGROUND CABLE – VOLTAGE OF BASIC SYMBOL
UNDER CONSTRUCTION – VOLTAGE OF BASIC SYMBOL
INTERCONNECTION
NOMINAL RATING – MEGAWATTS
GENERATING PLANTS & SUBSTATIONS
GENERATING PLANT – CAPABILITY IN MEGAWATTS; INDUSTRIALS OMITTED
TRANSMISSION SUBSTATION
DISTRIBUTION SUBSTATION (OMITTED SOUTH OF BROWARD SUBSTATION)
TRANSMISSION SUBSTATION OR GENERATING PLANT WITH TRANSFORMATION OF TRANSMISSION VOLTAGE
UNDER CONSTRUCTION
NOTES
(1) LIMITED BY TRANSFORMER CAPACITY
(2) 240 KV CONSTRUCTION, 138 KV OPERATION
(3) 240 KV CONSTRUCTION, 115 KV OPERATION
SCALE IN MILES
STATE OF FLORIDA
ELECTRIC SYSTEM MAP
OF MAJOR TRANSMISSION LINES
PREPARED BY FLORIDA POWER & LIGHT COMPANY
H V STREET, CHIEF ENGINEER
STAFF EXHIBIT No. 8B
Docket No. E-7210
30003

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1970

70-38

No. 958

FEDERAL POWER COMMISSION, *Petitioner*,

v.

FLORIDA POWER & LIGHT COMPANY, *Respondent*.

On Petition for Writ of Certiorari to the United States Court of Appeals for the Fifth Circuit

MOTION FOR LEAVE TO FILE BRIEF AMICUS CURIAE, AND BRIEF

NORTHCUTT ELY
1200 Tower Building
Washington, D. C. 20005
General Counsel
American Public Power Association

PRESS OF BYRON S. ADAMS PRINTING, INC., WASHINGTON, D. C.

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1970

No. 958

FEDERAL POWER COMMISSION, *Petitioner,*

v.

FLORIDA POWER & LIGHT COMPANY, *Respondent.*

On Petition for Writ of Certiorari to the United States Court of Appeals for the Fifth Circuit

---

MOTION FOR LEAVE TO FILE BRIEF AMICUS CURIAE

The American Public Power Association respectfully moves this Court for leave to file the accompanying brief in this case as *amicus curiae,* in support of the petition for certiorari of the Solicitor General on be-

half of the Federal Power Commission. The attorneys for the petitioner have consented to the filing of this brief, but the attorneys for the respondent, Florida Power & Light Company (FPL), have refused consent.

The applicant, American Public Power Association (APPA), a national service organization, has an interest in this case in that it represents more than 1,400 local, publicly owned electric utilities in 48 States, Puerto Rico, the Virgin Islands and Guam. Many of these publicly owned utilities are directly and seriously affected by the decision in the court below.

The basic issue presented in the Federal Power Commission's petition for certiorari is whether the interconnection of an electric power utility with an interstate transmission grid involves "transmission of electric energy in interstate commerce" and thus makes the utility subject to the Commission's regulatory jurisdiction pursuant to section 201 of the Federal Power Act, 16 U.S.C. 824.

In finding that FPL's interconnection with an interstate transmission grid involved the interconnecting utility in interstate commerce, the Commission relied upon the "electromagnetic unity" theory and the "commingled tracing" theory. This involved a high degree of expertise. The court below overturned the Commission's determination, rejecting the Commission's exercise of its expertise, substituted that proposed by FPL, and held FPL to be free of the Commission's jurisdiction. In short, FPL's election to participate in an interstate power pool, to obtain the benefit of reserve generating capacity in power

systems in other States, in consideration of its dedicating reserve capacity on its own system for use in those other States, was held to have no consequences with respect to interstate commerce, that is, interstate transmission of energy. *Florida Power & Light Company* v. *Federal Power Commission,* Op. No. 24956 (5th Cir., July 13, 1970).

The decision below leaves the Commission with no adequate basis for determining the scope of its own jurisdiction. Such uncertainty would jeopardize the Commission's ability to regulate sales at wholesale of interest power and to order, under appropriate circumstances, interconnections between utilities.

The Commission's power to compel interconnections under section 202 of the Act (16 U.S.C. 824a(b)), and its jurisdiction under sections 205 (16 U.S.C. 824d) and 206 (16 U.S.C. 824e) over sales at wholesale by private companies to the public power systems with which they are interconnected, are absolutely vital for the survival of many of the dispersed, publicly owned utility systems which meet an important portion of the Nation's electric energy needs. Many of these systems are members of the American Public Power Association. Both facets of the Commission's jurisdiction turn on the interpretation to be given to section 201 of the Act, the question at issue in this case.

The decision of the court below thus presents an important question of federal law which has not been, but should be, settled by this Court.

The American Public Power Association respectfully requests this Court to grant it permission to file its

annexed brief *amicus curiae* in support of the Commission's petition for writ of certiorari.

Respectfully submitted,

NORTHCUTT ELY
1200 Tower Building
Washington, D. C. 20005
General Counsel
American Public Power Association

IN THE

Supreme Court of the United States

OCTOBER TERM, 1970

No. 958

FEDERAL POWER COMMISSION, *Petitioner*

v.

FLORIDA POWER & LIGHT COMPANY, *Respondent*

On Petition for Writ of Certiorari to the United States Court of Appeals for the Fifth Circuit

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BRIEF OF AMERICAN PUBLIC POWER ASSOCIATION AS AMICUS CURIAE

The American Public Power Association supports the petition of the Solicitor General for writ of certiorari.

The Association is a service organization representing more than 1,400 local publicly owned power systems in 48 States, Puerto Rico, the Virgin Islands and Guam.

These systems are vitally affected by the interpretation of section 201 of the Federal Power Act (16 U.S.C. 824), the issue presented by this case.

A high proportion of the local publicly owned power systems of the United States are dependent for crucial portions of their power supply, in some cases their entire supply, upon interconnections with privately owned power systems. They are also, in many cases, dependent upon such interconnections for reserve sources of power, to be made available in emergencies, and to be made available to permit scheduled shutdowns of equipment for maintenance. Moreover, to obtain the advantage of size of generating units, and thus reduce generating costs, smaller municipalities must have access, through interconnection, to generating plants far larger than they can afford for their individual requirements alone.

The jurisdiction of the Federal Power Commission to compel such interconnections under section 202 of that Act (16 U.S.C. 824a(b)), and to regulate the rates at which such power is supplied thereby, under sections 205 (16 U.S.C. 824d) and 206 (16 U.S.C. 824e), has been, and will be again, vital to the survival of many of the smaller municipally owned power systems.

This jurisdiction, in turn, depends on whether, in the instant case, the Commission or the Court of Appeals was right in interpreting section 201(b) of the Act; that is to say,

> (1) whether the participation of the Florida Power & Light Company (FPL) in an interstate power pool constituted the "transmission of electric energy in interstate commerce," thus characterizing that Company as a "public utility"

within the meaning of section 201(e), as the Commission held, or

(2) whether the exclusion of the Commission's jurisdiction which section 201(b) stipulates with respect to "facilities used in local distribution" deprives the Commission of all jurisdiction over all facilities and services of this member of that interstate power pool, as the court below believed.

By the terms of section 201(c), the test of whether electric energy is to be held to be transmitted in interstate commerce depends on whether it is "transmitted from a State and consumed at any point outside thereof." The Commission, applying its expertise to the facts in this case, held that this test of section 201(c) was met; the court held to the contrary.

The important point is thus presented, at the outset, as to whether this Court, for the first time, shall sanction a lower court's substitution of its own expertise, in a highly technical matter, for the expertise of the Commission.

The question so resolved was stated in this way in the Trial Examiner's notably lucid opinion (page references are to those of the Solicitor General's Petition for Certiorari, which annexes both the Commission's decision and that of the Examiner).

Page 69:

"Florida [Florida Power & Light Company] and the other members of the Florida Operating Committee are members of a multi-state electric network, the Southeast Region of the Interconnected Systems Group (ISG) which covers the southeastern and central portions of the country. Florida operates in synchronism with the 140 mem-

bers of ISG and is ready to assist them or to receive assistance from them in case of emergency. Thus during a 580 mw generator loss by a midwestern utility Florida contributed 8 mw to ISG."[1]

Pages 70-71:

"Under Section 201(c) of the Act electric energy is transmitted in interstate commerce if transmitted from a State and consumed at any point outside thereof within the United States. Granted that electric energy is transmitted between Florida and Corp [Florida Power Corporation], and between Corp and Georgia [Georgia Power Company], the question is posed: Is electric energy transmitted to Florida from Georgia or to Georgia from Florida? The answer depends on what constitutes interstate transmission of electric energy.

"Electric power on Florida, Corp, and Georgia and all other interconnected systems is supplied as alternating current at a frequency of 60 cycles. Interconnected synchronous operation, or "parallel operation," as the term is used in the industry, requires that the frequency of each system be in synchronism with that of all others in the interconnection. Two or more electric systems cannot (except under special and rare conditions) operate together unless they are in synchronism. This

[1] At p. 67, the Examiner says:

"Interchanges of power are measured, netted, and payment is made for the balance at regular intervals.

"In its 1965 Form 12 report Florida lists its reserve capacity at 656,000 kw, 411,000 kw from its own system, and in addition, from the other members of the Florida Operating Committee, 'Reserve capacity usually available amounts to 245,000 kw. This is spinning reserve instantly available for emergencies from Florida Power Corporation ["Corp"], Tampa Electric Company, City of Jacksonville and Orlando Utilities Commission.' Florida also contributes to the joint reserves of the other members of the Florida Operating Committee."

means that the current pulses on these systems, and thus the frequency, coincide exactly; not approximately, but exactly. Birmingham is served by Alabama [Alabama Power Company] which is interconnected with Georgia which is interconnected with Corp. Miami is served by Florida which is interconnected with Corp. The frequency of the pulses is exactly the same in Miami and Birmingham, and if it changes to a new value in Birmingham, then it change to exactly that same value in Miami. The speed of every electric generator on every electric system in an interconnected group is irrevocably locked to the same frequency. A variation in one affects all."

* * * * *

Page 75:

"Thus there is a free flow of power and energy throughout the electric network in which Corp and Georgia participate. There is also a free flow of power and energy throughout the electric network formed by Corp and Florida. And there is a free flow of energy among Georgia, Corp, and Florida.

"All 140 members of the ISG operate in parallel. All are interlocked electromagnetically and maintain the same frequency. Each member renders automatic assistance to the other in times of emergency. As previously noted, Florida can receive from or contribute to ISG up to 100 mw. The network formed by all the members of ISG and the tie line bias and frequency control used by member systems provide mutual assistance in maintaining standard 60-cycle frequency, thereby improving the efficiency of operation of all."

Pages 78-79:

"If a housewife in Atlanta on the Georgia system turns on a light, every generator on Florida's system almost instantly is caused to produce some quantity of additional electric energy which serves

to maintain the balance in the interconnected system between generation and load. If sensitive enough instruments were available and were to be placed throughout Florida's system the increase in generation by every generator on Florida could be precisely measured.

"Nobody can say for certain just how electricity is really transmitted. The analogy to a flow of water is metaphorical only. Does an electron move from one end of a thousand mile wire to another? Or is there only interaction between neighboring electrons or between fields of force? The answer is not important for legal purposes. The significant factors are that Florida's generators are interlocked electromagnetically with Georgia's and that in consequence, Florida's generators increase their production of electric energy almost instantaneously and automatically in response to increases in load on Georgia's system thereby contributing in some measure to the system supply which meets the increased Georgia load, reducing the variation in frequency on the Georgia system, and increasing its efficiency of operations. Without the Florida response the electric reactions on Georgia and the interconnected systems would be different.

"The cause and effect relationship in electric energy occurring throughout every generator and point on the Georgia, Corp and Florida systems constitutes interstate transmission of electric energy by, to, and from Florida. It is the electromagnetic unity of response of Florida, Corp, Georgia and other interconnecting systems that constitutes the interstate transmission of electric energy by Florida."

The Commission, exercising its expertise, sustained the Examiner's engineering concept and his conclusion of law based thereon. The court rejected both, impliedly adopting instead FPL's theory. Never very

clearly explained below, this was called the "system studies method." The Examiner had rejected it as an invalid engineering exercise, for these reasons:

Page 81:

> ". . . Thus in the systems studies method, the flow of electric energy instant by instant in the bus is treated as constant in magnitude and as being in a single direction. This result is achieved by taking the algebraic sum of the magnitudes and directions of each of the three power phases and using the combined value of three phase power as representative of the power flow.
>
> "This unidirectional combined value of three phase power is purely a mathematical concept."

Page 82:

> "The systems studies method is used for certain types of engineering studies. For these purposes the use of unidirectional combined values is satisfactory because all that is desired is a mathematical answer regardless whether it is in consonance with the physical dynamics of the situation. The combining of magnitudes and directions is similar to the technique of averaging. Both are meaningful methods of representing certain aspects of data. Thus average per capita income can be a useful concept. But on the basis of average per capita income, there are no poor in the United States. The average is not fully descriptive of the reality, which is a range of incomes from poor to rich. Similarly, the combining of magnitudes and direction of each of the three phases does not provide an adequate description of the dynamic phenomena that occur in a three phase bus which serves as a junction for numerous three phase lines."

It seems manifest, at least to us, that this case presents exactly the type of problem that Congress en-

trusted to the expertise of the Commission, and the Commission's determination that these interconnections established the interstate transmission of energy is conclusive. The question of whether this Court, for the first time, shall sanction the substitution by a lower court of its own expertise for that of the Federal Power Commission is itself a particularly important question of law.

The Examiner likewise held, and the Commission agreed, that the whole huge Florida Power & Light Company system did not constitute "facilities used in local distribution," excluded from the Commission's jurisdiction. He found, and the Commission agreed, that:

Page 86:

> "Florida has a transmission grid of 2,500 miles, of which 1,400 are high voltage, 115 kv or above. There are 1,100 miles of transmission facilities used for local distribution. The 1,400 miles of high voltage lines are anterior to distribution to local consumers and are not 'facilities used in local distribution.' "

The court held otherwise.

The conclusion of the court below that, on these facts, Florida Power & Light Company is not to be deemed to be engaged in interstate commerce within the meaning of section 201 of the Federal Power Act raises a question of law of Nation-wide importance. It is a particularly grave question because the protection of the Nation against "black-outs" and power shortages requires the interstate interconnection of the Nation's power systems which make possible the pooling of reserve capacities in different States just as was done

here. The jurisdiction of the Commission to coordinate these activities is essential to the national welfare. This kind of interstate commerce is particularly in need of federal regulation. But the lower court's decision opens the door to wholesale evasion of the Commission's jurisdiction by the creation of buffer corporations which may own and operate the facilities which overlap State lines, through which, in turn, interconnections are made with companies on each side of the line, thereby securing the advantages of interstate power pools free of federal regulation.

The petition for certiorari should be granted.

Respectfully submitted,

NORTHCUTT ELY
General Counsel
American Public Power Association

SUPREME COURT U. S.

DEC 9 1970

E. ROBERT SEAVER, CLERK

IN THE

Supreme Court of the United States

OCTOBER TERM, 1970

No. ~~958~~ 70-38

FEDERAL POWER COMMISSION,

Petitioner,

v.

FLORIDA POWER & LIGHT COMPANY,

Respondent.

ON PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FIFTH CIRCUIT

BRIEF FOR THE RESPONDENT IN OPPOSITION

LEON JAWORSKI
JEFFERSON D. GILLER
FULBRIGHT, CROOKER, FREEMAN, BATES & JAWORSKI
800 Bank of the Southwest Building
Houston, Texas 77002

HARRY A. POTH, JR.
RICHARD M. MERRIMAN
REID & PRIEST
1701 "K" Street, N. W.
Washington, D. C. 20006

Attorneys for Respondent

December, 1970

FIDELITY PRINTING COMPANY, INC., HOUSTON

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1970

No. 958

FEDERAL POWER COMMISSION,

Petitioner,

v.

FLORIDA POWER & LIGHT COMPANY,

Respondent.

ON PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FIFTH CIRCUIT

BRIEF FOR THE RESPONDENT IN OPPOSITION

OPINIONS BELOW

An adequate reference to the opinions delivered in the court below and in the Federal Power Commission is made in the Petition.

JURISDICTION

The jurisdictional requisites are set forth in the Petition.

QUESTION PRESENTED

It is respectfully submitted that the following question, rather than the question urged by the Petitioner, is the one correctly here presented, in the light of the opinion of the Court of Appeals (Petition App. A, pp. 13-33):

Whether the Court of Appeals correctly held that the Federal Power Commission failed to carry its burden to prove that there had been a "transmission of electric energy *in* interstate commerce" to or from the facilities of Florida Power & Light Company (Respondent) so as to subject Respondent to the Commission's regulatory jurisdiction.

STATUTE INVOLVED

The statutory provisions involved are adequately set forth in the Petition.

STATEMENT OF THE CASE

While a portion of the Statement presented by the Commission is argumentative in nature, being categorizations and inferences from the facts, rather than simply a statement of the facts themselves, it is otherwise accurate. However, the Statement omits the following facts about Respondent's business which Respondent deems relevant to a determination of the urgency for granting the Petition.

Respondent's facilities are not only located wholly in Florida, but substantially all of these are located in the southern portion of Florida, with about 75% of Respondent's electric load being located at the extreme southern end of the peninsula between West Palm Beach and Miami, approximately 400 miles south of the Georgia border. Respondent's sales are almost exclusively retail sales; it sells to only six customers at wholesale, these being local cooperatives. These wholesale sales accounted for less than 1% of Respondent's revenues from sales of electricity. Respondent owns no facilities which cross state lines, nor do any of the four other electric entities with which Respondent has connections own any facilities which cross state lines. Only one of these other entities, Florida

Power Corporation (Florida Corp) has connections at — but not across — the Florida-Georgia state line and regularly engages in the purchase and sale of electricity across this border.

The Commission's assertion of jurisdiction, and its attempt to prove interstate transmission of electric energy from or to Respondent, was based on a connection between Respondent and the Florida Corp system, and a connection between the Florida Corp system and utilities operating in Georgia. (Petition App. C, pp. 41-44). This interconnection between Respondent and Florida Corp is a 200-foot bus located 180 miles south of the Georgia state line. (Petition App. C, p. 56). Electric flows to and from this bus were the subject of considerable testimony. (Petition, p. 6).

The connections between Respondent and the other four Florida electric entities (including Florida Corp) constitute what is sometimes labeled the "Florida Pool". However, as the court below stated, it is not a "power pool". (Petition App. A, p. 30). These connections are for emergency purposes only and are not intended for regular sales or exchanges of power. (Petition App. D, p. 67). Respondent has no exchange arrangements with any electric company except the arrangement for emergency purposes with the said four Florida electric entities (Petition App. A, p. 17).

The Interconnected Systems Group described in the Petition is not an organized pool with which Respondent has any contractual obligation nor is the operation of Respondent's system dependent on the Interconnected Systems Group. Because of the unique peninsular location of the Respondent's system and the frequency and severity of lightning, storms and hurricanes, Respondent has always designed and operated its system in such a way that it is not and will not be dependent upon others to supply any part of its predictable load. (Petition App. D, p. 65).

The Commission's position is that it has proven interstate flow of electricity because (1) Respondent's connection with Florida Corp and Florida Corp's connection with others results in operations of systems outside the State of Florida and operations of Respondent "affecting" each other or (2), alternatively, its commingled method of tracing power, particularly through the 200-foot bus connecting Florida Corp and Respondent, demonstrated that interstate electricity moved into and out of Respondent's system. (Petition, pp. 5, 6).

ARGUMENT IN OPPOSITION

The Commission argues, as reasons for granting the writ, that the decision below (a) conflicts with those of other courts of appeal,[1] (b) leaves it with no way for determining its basic jurisdiction, and (c) will promote uncertainty and further litigation. These arguments will not stand close examination. What the Commission is really complaining about is that it must recognize that there are some limits on its jurisdiction where the language of the Power Act — giving the Commission jurisdiction over facilities for the transmission of electric energy "in" interstate commerce — clearly indicates that Congress did not purport to exercise its full constitutional authority over facilities which merely "affect" interstate commerce.

As to the alleged conflict between the decision below and those of four other courts of appeal, not only the two dissenting commissioners, but the court below concluded that there was no such conflict. The latter neither disagreed

[1] *Indiana & Michigan Electric Co.* v. *FPC,* 365 F.2d 180 (7th Cir.), cert. denied, 385 U.S. 972; *Arkansas Power & Light Co.* v. *FPC,* 368 F.2d 376 (8th Cir.); *Public Service Co. of Indiana* v. *FPC,* 375 F.2d 100 (7th Cir.), cert. denied. 387 U.S. 931; *Cincinnati Gas & Electric Co* v. *FPC,* 376 F.2d 506 (6th Cir.), cert. denied, 389 U.S. 842.

with nor declined to follow the other courts of appeal. To the contrary, the Fifth Circuit suggested several sound reasons for distinguishing the other cases.

First, those cases all dealt with electric companies which admittedly received electricity transmitted in interstate commerce and were thus subject to the jurisdiction of the Commission. The only question in those cases was whether or not a particular sale or group of sales made by a utility which admittedly had interstate electricity in its system (and in at least two of the cases, admittedly had delivered such interstate electricity to other customers) was subject to the wholesale rate regulation jurisdiction of the Commission. And the Fifth Circuit was in full agreement with the Eighth Circuit in distinguishing between the kinds of evidence required to establish rate jurisdiction over wholesale sales and plenary jurisdiction over a utility:

> "We agree with the court in *Arkansas Power & Light*, supra, at 383, n.8, that establishing wholesale rate jurisdiction over an electric company which is a public utility within the Act is a different matter from establishing plenary jurisdiction over a company based on interstate transmission." (Petition App. A, p. 29).

Second, the effect of interconnection on the question of the interstate transmission of electric energy was not in issue in the other cases. Since interstate electricity was admittedly in the four systems involved, the courts were not called upon to, nor did they, pass upon the Commission's primary contention here that interstate flow of electricity is established by the "effect" one interconnected system has on the other.

Third, each of the companies involved in the allegedly conflicting cases was a participant in an integrated multi-state power pool and engaged in substantial and continuous sales and exchanges of power with members of the pool

located in other states. It was in that context, and not because of any scientific advances since the adoption of the Power Act, that the courts approved the Commission's commingling theory of tracing electricity. The court below does not in any way disparage the use of that theory in such a context. As stated above, Respondent did not participate in such a "power pool" but was merely connected to Florida Corp. The position of the court below with respect to the need for tracing through the bus connecting Respondent and Florida Corp is the same as that of this Court in *Jersey Central Power & Light Co.* v. *F.P.C.*, 319 U.S. 61. In each case, the critical inquiry was directed at electric flows through a bus; in each the Court held, "Mere connection determines nothing" (319 U.S. at 72); and in each it was necessary, when attempting to establish plenary jurisdiction over the company, to trace flows to and through the bus and not merely to show connections to the bus.

The commingling tracing theory urged by the Commission requires that the 200-foot bus be treated as a "point, a tank or a reservoir" in an electrical system. (Petition, p. 6, n.1 and App. D, pp. 81-82). This theory assumes 200 feet to be a point, which it is not; or assumes there can be a tank or reservoir of electricity, which is an impossibility since electricity cannot be stored. The Commission's theory is thus a legalistic rather than an engineering or scientific one, and the use of such legalistic tests in determining electrical flow was condemned by this Court in *Connecticut Light and Power Co.* v. *F.P.C.*, 324 U.S. 515 at 529.

Finally, the lower court sets out several considerations as to why one test may be used in determining rate jurisdiction over wholesale sales of a company admittedly subject to the Commission's jurisdiction and a different test be employed when the question is whether the Commission has jurisdiction over a company in the first place:

> "A consideration in the wholesale sale case is the seeming irrationality of allowing Commission jurisdiction over wholesale sales to which experts can trace some out of state energy, but not over those to which it might be impossible to trace interstate power, when it is obvious that there is interstate power in substantial portions of the utility's system. *Cf. Arkansas Power & Light, supra.* Another consideration is the seeming irrationality of a public utility with interstate electric energy flowing in its system escaping FPC jurisdiction over wholesale sales because of impossibility of proof arising from the inadequacy of instruments used by the utility itself. *Cf. Indiana & Michigan, supra.* These considerations have little application to the problems of federalism and reservations of power to the states imposed by the instant case, where the issue is one of whether FPL is a public utility at all, measured under tests articulated by the Congress and the courts in terms of actual transmissions of interstate energy." (Petition App. A, pp. 29-30).

While the Commission now characterizes as "untenable" the distinction drawn by the Fifth Circuit, it fails to criticize, or even comment upon, the considerations underlying the court's distinction.[2]

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[2] Respondent submits that if this straight jurisdiction case imposes a greater burden on the Commission than the "power pool" wholesale sales case, this difference is entirely proper in view of the greater consequences resulting from the declaration of a "public utility" status. Imposing rate regulation over one or more sales does not have the impact that initially bringing an electric company under Commission jurisdiction has. State regulation is wholly supplanted by federal regulation; a change in the accounting and property records system may be required (as here); reporting requirements are broadened; approval is required for proposed offerings of stock, mortgage bonds, notes and other financings, as well as mergers, acquisitions, and other corporate transfers; interconnections and sales of power may be compelled for reasons other than the interests of local consumers — all of this in addition to rate regulation over wholesale sales.

The Commission next asserts that the decision of the court below "leaves the Commission with no adequate basis for determining the scope of its own jurisdiction." This is not a reasonable statement in the light of the 25-year guidance offered by this Court in the *Jersey Central* case which involved a physical arrangement similar to that of the present case as described above. The Commission in that case was able to trace interstate flows into and out of the system under question. 319 U.S. at 65, 66. If the Commission, under the technology involved at the time of the investigation in the *Jersey Central* case (1937 and 1938) could trace interstate flows, it would seem that if interstate flows into or out of Respondent's system had actually existed in the present case, the Commission could have traced it. The Commission's problem was not that it had "a burden that is impossible to meet in the present state of technical knowledge." (Petition, p. 11). The Commission's problem was that the facts it gathered for the case left Respondent beyond its jurisdictional grasp. Its own Examiner found that a conventional tracing method previously used by the Commission, and here adopted by Respondent in presenting its case, showed there was no flow of interstate electrical energy into or out of Respondent's system. (Petition App. D, p. 80).

The Commission also complains that "considerable uncertainty" will prevail "with a likelihood of substantial further jurisdictional litigation." This anxiety on the part of the Commission is expressed without any substantiation by supportive facts or even by examples of situations in which this "uncertainty" might appear. One reason for this lack of documentation is that the situation with Respondent is rather special. The geographical arrangement of Respondent's facilities in the peninsula of Florida is of course not duplicated anywhere else in the country. Actually this phase

of jurisdiction is really not an issue of great magnitude. It is basically a settled area of the law, as evidenced by the fact that only four Supreme Court cases have directly dealt with issues of jurisdiction over a company by virtue of its interstate transmissions.[3] While the Commission may face the prospect of from time to time having to determine whether it may regulate certain sales of a company already subject to its jurisdiction, it may do so in reliance on the four other court of appeals decisions which were not disturbed by the decision below.

Respondent submits that between the *Jersey Central* line of cases, of which this is one, and the "power pool" cases, the jurisdiction of the Commission is quite well defined, and the "substantial further jurisdictional litigation" is a spectre without substance.[4] It is respectfully submitted that the Commission's desire for symmetry of the tests to be used to determine jurisdiction in these two distinct situations is an academic one and one which need not, absent a more convincing demonstration by the Commission, involve this Court in what is essentially a factual, albiet highly technical, inquiry.

In the final paragraph of its petition, the Commission again reveals the real basis of its complaint: Respondent should be subject to Commission jurisdiction because it *affects* interstate commerce by its operation. Whether Respondent does in fact affect interstate commerce is immaterial here, for Respondent is subject to regulation by the Commission only if it transmits electrical energy "*in* interstate commerce".[5] What the Commission wishes from

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[3] *Jersey Central Power & Light Co.* v. *FPC*, supra; *Connecticut Light & Power Co.* v. *FPC*, supra; *Pennsylvania Water & Power Co.* v. *FPC*, 343 U.S. 414; and *FPC* v. *Southern California Edison Co.*, 376 U.S. 205.

[4] According to the Commission's Annual Reports no electric jurisdiction cases have been initiated since 1966.

[5] Section 201(b) of the Federal Power Act, 49 Stat. 847 (16 U.S.C. §824(b)).

this Court is legislative revision, not judicial application. The court below simply applied the statutory standard and found the proof wanting. The Commission's complaint, being legislative in nature, can only be properly considered by Congress.

CONCLUSION

WHEREFORE PREMISES CONSIDERED, it appears that there are no special and important reasons for the Court to review this case, and accordingly Respondent prays that the Petition for Writ of Certiorari be denied.

Respectfully submitted,

LEON JAWORSKI
JEFFERSON D. GILLER
FULBRIGHT, CROOKER, FREEMAN,
BATES & JAWORSKI
800 Bank of the Southwest
Building
Houston, Texas 77002

HARRY A. POTH, JR.
RICHARD M. MERRIMAN
REID & PRIEST
1701 "K" Street, N. W.
Washington, D. C. 20006

Attorneys for Respondent

PROOF OF SERVICE

Service of this Brief for the Respondent in Opposition has been made upon the Federal Power Commission by mailing copies hereof airmail postage prepaid to Mr. Erwin N. Griswold, Solicitor General, Department of Justice, Washington, D. C. 20530 this 7th day of December, 1970.

Original Signed By
Leon Jaworski
Attorney for Respondent

Supreme Court, U.S.
FILED
DEC 18 1970
E. ROBERT SEAVER, CLERK

IN THE

Supreme Court of the United States

OCTOBER TERM, 1970

No. ~~958~~ 70-38

FEDERAL POWER COMMISSION,

Petitioner,

v.

FLORIDA POWER & LIGHT COMPANY,

Respondent.

ON PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FIFTH CIRCUIT

OBJECTION OF RESPONDENT TO MOTION OF AMERICAN PUBLIC POWER ASSOCIATION FOR LEAVE TO FILE BRIEF AMICUS CURIAE

LEON JAWORSKI
JEFFERSON D. GILLER
FULBRIGHT, CROOKER, FREEMAN, BATES & JAWORSKI
800 Bank of the Southwest Building
Houston, Texas 77002

HARRY A. POTH, JR.
RICHARD M. MERRIMAN
REID & PRIEST
1701 "K" Street, N. W.
Washington, D. C. 20006

Attorneys for Respondent

December, 1970

FIDELITY PRINTING COMPANY, INC., HOUSTON

IN THE

Supreme Court of the United States

OCTOBER TERM, 1970

No. 958

FEDERAL POWER COMMISSION,

Petitioner,

v.

FLORIDA POWER & LIGHT COMPANY,

Respondent.

ON PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FIFTH CIRCUIT

OBJECTION OF RESPONDENT TO MOTION OF AMERICAN PUBLIC POWER ASSOCIATION FOR LEAVE TO FILE BRIEF AMICUS CURIAE

Respondent, Florida Power & Light Company, objects to the motion of American Public Power Association ("APPA") seeking leave to file its amicus curiae brief because (a) the issues in this case have been fairly drawn in the Petition and the Brief in Opposition thereto, and therefore the legal argument made by APPA on those issues is superfluous; and (b) more importantly, the proposed brief of APPA contains a significant misstatement as to the issues involved.

That misstatement arises as follows: Section 201(b) of the Act (16 U.S.C. § 824(b)) exempts local distribution facilities from Commission jurisdiction whether or not interstate electricity moves through those distribution facilities. The majority of the Commission held that Respon-

dent's facilities were not within this exemption. APPA states that the Court of Appeals for the Fifth Circuit overruled the Commission on this point and that the lower court's action in so doing presents a separate error and question for this Court to review. (APPA Brief, pp. 7, 12).

It is simply not true that the court below overruled the Commission on this point. The court below did not even pass on it. Respondent did not argue this point in its brief to the court below, and the Commission specifically noted in its brief below that this exemption was not an issue (Commission Brief, p. 8, fn. 9). Neither the Solicitor General nor the Respondent argued in the Petition and the Brief in Opposition to this Court the applicability vel non of this exemption.

For the foregoing reasons, Respondent prays that the motion of APPA for leave to file its amicus curiae brief be denied.

Respectfully submitted,

Original Signed By
Leon Jaworski

LEON JAWORSKI
JEFFERSON D. GILLER
FULBRIGHT, CROOKER, FREEMAN,
BATES & JAWORSKI
800 Bank of the Southwest
Building
Houston, Texas 77002

HARRY A. POTH, JR.
RICHARD M. MERRIMAN
REID & PRIEST
1701 "K" Street, N. W.
Washington, D. C. 20006

Attorneys for Respondent

PROOF OF SERVICE

Service of this Objection of Respondent to Motion for Leave to File Brief Amicus Curiae has been made upon the Federal Power Commission by mailing copies hereof airmail postage prepaid to Mr. Erwin N. Griswold, Solicitor General, Department of Justice, Washington, D. C. 20530 and upon the American Public Power Association by mailing copies hereof airmail postage prepaid to Mr. Northcutt Ely, 1200 Tower Building, Washington, D. C. 20005 this 16th day of December, 1970.

Original Signed By
Leon Jaworski

Attorney for Respondent

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FLORIDA POWER & LIGHT COMPANY

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FIFTH CIRCUIT

MOTION FOR LEAVE TO FILE AMICUS CURIAE AND BRIEF OF GAINESVILLE UTILITIES DEPARTMENT AND CITY OF GAINESVILLE, FLORIDA

GEORGE SPIEGEL
SANDRA J. STREBEL
JAMES F. FAIRMAN, JR.
2600 Virginia Avenue, N.W.
Washington, D.C. 20037
MELVIN RICHTER
1001 Connecticut Avenue, N.W.
Washington, D.C. 20036
Attorneys for Amicus Curiae

May, 1971

Washington, D. C. THIEL PRESS 202 393-0625

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FEDERAL POWER COMMISSION, *Petitioner*

v.

FLORIDA POWER & LIGHT COMPANY

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FIFTH CIRCUIT

MOTION FOR LEAVE TO FILE BRIEF AMICUS CURIAE

Gainesville Utilities Department and the City of Gainesville, Florida (Gainesville), hereby respectfully move for leave to file the accompanying brief in this case as *amicus curiae* in support of the Federal Power Commission in the above captioned proceeding. The Solicitor General has consented to the filing of the brief, but the attorneys for respondent, Florida Power & Light Company (FPL), have refused consent.

The City of Gainsville owns an electric generating, transmission and distribution system located in Alachua County, Florida. This system, which is operated by Gainesville Utilities Department, serves some 22,000 customers within and

utside the City in competition with Florida Power Corporation (Florida Power). Since Gainesville has been operating in isolation with a rapidly growing load, entry into the Florida power pool in which FPL is the largest member would be highly beneficial to the public served by Gainesville by making available to it the many and valuable benefits available through such pool operation.

Prior to the filing of the complaint which culminated in the Commission's decision in *Gainesville v. Florida Power Corp.*, 40 FPC 1227, reversed in part, 425 F.2d 1196 (5th Cir., 1970), pending on writ of certiorari, No. 464 this Term, Gainesville sought to obtain such access through interconnection with FPL. However, FPL was unwilling voluntarily to interconnect with Gainesville. Accordingly, since FPL had not yet been found to be a "public utility" subject to Commission regulation under the Federal Power Act, Gainesville by complaint filed with the Commission sought interconnection with Florida Power, an admitted "public utility" under the Federal Power Act.

Even should this Court in No. 464 reinstate the terms and conditions prescribed by the Commission in directing Florida Power to interconnect with Gainesville, Commission jurisdiction over FPL would still be of vital concern to Gainesville. Not only may further Commission action be required in order to obtain appropriate participation for Gainesville in the Florida pool, but Gainesville's relation with FPL within the pool may call for Commission supervision. In any case, quite apart from the Florida pool itself, Gainesville's close proximity to FPL lines makes it highly desirable for Gainesville also to interconnect and operate in coordination with FPL; and Gainesville's past experience strongly indicates the need for an exercise of Commission jurisdiction in order to bring even a limited interconnection between FPL and Gainesville into being.

Gainesville, thus, has a vital interest in the question whether FPL is a public utility under the Federal Power Act presented by the Commission's petition herein. Gaines-

herefore, respectfully requests the Court to grant it
o file the attached brief *amicus curiae* in support of
mmission.

Respectfully submitted,

GEORGE SPIEGEL
SANDRA J. STREBEL
JAMES F. FAIRMAN, JR.
2600 Virginia Avenue, N.W.
Washington, D.C. 20037

MELVIN RICHTER
1001 Connecticut Ave., N.W.
Washington, D.C. 20036

Attorneys for Amicus Curiae

971

IN THE

Supreme Court of the United States

OCTOBER TERM, 1970

No. 958

FEDERAL POWER COMMISSION, *Petitioner*

v.

FLORIDA POWER & LIGHT COMPANY

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FIFTH CIRCUIT

BRIEF OF GAINESVILLE UTILITIES DEPARTMENT, CITY OF GAINESVILLE, FLORIDA, AS AMICUS CURIAE

By leave of this Court, Gainesville Utilities Department and the City of Gainesville, Florida (Gainesville), file this brief as *amicus curiae* in support of the Commission in the above-captioned proceeding.

INTEREST OF AMICUS CURIAE

As set out in the attached motion, Gainesville has a vital interest in the status of Florida Power & Light Company

(FPL) under the Federal Power Act even should this Court in No. 464 reinstate the terms and conditions prescribed by the Commission in directing Florida Power to interconnect with Gainesville. Not only may Commission action still be required for Gainesville to obtain appropriate participation in the Florida pool in which FPL is the largest member, but Gainesville's relationships with FPL within the Pool may call for Commission supervision. In any case, quite apart from the Florida pool itself, it would be in the public interest in light of Gainesville's close proximity to FPL lines, for Gainesville to interconnect and operate in coordination with FPL. Since FPL has been unwilling to interconnect voluntarily with Gainesville, Commission action may be required.

ARGUMENT

In this case, the Commission has found that FPL, although wholly located within the State of Florida, transmits power in interstate commerce and hence is a "public utility" subject to Commission regulation under the Federal Power Act. The Fifth Circuit has set aside that determination. We submit that reversal of the Fifth Circuit's decision is essential to achieving and preserving reliability of electric service in the State of Florida. Absent reversal of the decision below, FPL (as well as other utilities across the nation) will be encouraged to distort the engineering of its high voltage interconnections in an effort to avoid Commission jurisdiction. Since FPL owns almost 50% of the transmission facilities in Florida, any distortion of its engineering adversely affects the reliability of the total Florida interconnected high voltage transmission grid and all utilities connected thereto.

While we adopt in substance the Commission's brief, we believe that the following additional considerations serve to reinforce the Commission's argument:

1. The holding below fails to take into account that, as pointed out by the Commission (R. 2636), FPL has been operated in such a way as to receive "substantial benefits

from its participation in the Florida pool in the coordination of spinning reserves, the assurance of reliability of frequency control and from both the Florida Pool and ISG[1] in the form of automatic assistance in the case of emergencies."[2] The extent of FPL dependence on Florida Pool and ISG is indicated by the minimal level of FPL's reserve as reported by the Commission's Bureau of Power (Preliminary Report on Winter 1970-1971 Load Supply Situation (p. 4)):

> "Overall the Florida Power Pool appears to have satisfactory reserves. One member, Florida Power and Light Company is short of reserves with projected 392 mw or 7.5 percent reserve margin. Due to transmission limitations only limited help could be brought into the area should plants in the Miami area suffer high forced outages."

The reserve situation of FPL for the summer of 1971, as reported by the Commission's Bureau of Power (Preliminary Reports on Summer 1971 Electric Load-Supply Situation), is potentially even worse. That Report states in reference to the Florida Pool (p. 6):

> "The pool reserve of 12.9 percent is less than desirable, but the new 725-megawatt Turkey Point nuclear unit No. 3 near Miami, Florida, is scheduled for service in June. The installation of this unit will raise the reserve margin to 19.6 percent. The Florida Power Corporation's reserve is only 5.1 percent. *The Florida Power & Light Company's reserve is 3.5 percent.* This margin will be improved considerably

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[1] Interconnected Systems Group, consisting of 140 interconnected utilities spanning the southeastern and central portions of the United States (R. 2633).

[2] Although the assistance available to FPL from ISG is limited by the 100 mw capacity of the interconnection, 12 of FPL's 24 generating units generate 75 mw or less and the emergency outage of any one of these units would automatically bring assistance to FPL (see, R. 2632).

if the company's Turkey Point nuclear unit becomes available before the summer peak." (Emphasis added).

At the present time it appears most unlikely that FPL's Turkey Point nuclear unit will be in operation by June of 1971 and doubtful that it will even be in operation during the summer 1971 load season at all. FPL has applied to the Atomic Energy Commission (AEC) for an operating license for the unit, but as of April 28, 1971 no notice of proposed issuance of operating license had been issued by the AEC. After such a notice is issued, thirty days are allowed by the AEC for interventions, protests and requests for hearing before a license can be issued. Then after issuance of an operating license by the AEC, a testing period which generally takes a minimum of six weeks is required following fueling of the unit.

Thus, assuming immediate issuance of notice, assuming no interventions or hearing requests, assuming the immediate issuance of an operating license following the notice period, and assuming a flawless testing period, it would be mid-July before the unit could be ready for commercial operation. The fact is, however, that this unit has been the subject of much controversy by environmentalists and consequently it is most likely that requests for interventions and hearing will be filed with the AEC. Such hearings could delay the issuance of an operating license for some time.

In addition to possible regulatory delays, the operation of the plant is threatened by litigation to enjoin discharge of water from the unit into adjacent bodies of water, brought against FPL by the United States Government in the U.S. District Court of the Southern District of Florida, Civil Action No. 70-328-CA. That case is scheduled for pre-trial on May 10, 1971. Under these circumstances, the 3.5 per cent reserves for FPL cited by the Commission Staff Report appears likely to hold for the 1971 summer peak. As a result, FPL will in all probability be relying almost entirely on the Florida Power Pool for its reserves during the summer of 1971.

2. The reversal of the Fifth Circuit is important not only because of its impact upon the means available to the Commission for determining the scope of its own jurisdiction, or because of its bearing on the status under the Federal Power Act of FPL which, in addition to being the largest electric utility in Florida, ranked ninth nationally in 1965 in revenues, fourteenth in investments in gross electric utility plant, and sixteenth in kilowatt hour sales (see R. 2631). It is also important because in effect it prevents the Commission from ordering FPL to interconnect with others, particularly municipally-owned utilities in Florida, as provided in Section 202(b) of the Federal Power Act.

Throughout its National Power Survey (1964), the Commission repeatedly noted (particularly, p. 170, *et seq.*) that interconnection and coordination among electric utilities are highly desirable and to be fostered at all levels and at every opportunity since they open the way for many and valuable benefits, not the least of which arise from reduced overall generating requirements and lower unit costs achievable in the planning and construction of new facilities. Indeed, "[p]articipation of the small systems in the benefits of coordination and a continuous search for means of broadening this participation are fundamental if these systems are to continue to provide low cost power to their consumers and make the most efficient use of our fuel and capital resources." (Survey, p. 267)

Because of the unique peninsular nature of Florida, the small Florida utilities are peculiarly dependent for interconnections and coordination upon other utilities in Florida, in particular upon FPL, whose operations extend along most of the Florida east coast, and which owns almost 50% of the total transmission facilities in Florida.[3] As pointed out by the Commission (R. 2638):

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[3]Statistics of Privately Owned Electric Utilities in the United States, FPC 1968, pages 503A, 504A.

> "As the largest electric utility in the State of Florida, and as one of the major electric utilities in the United States, FPL's importance in insuring the increased reliability of interconnected power systems in Florida and in adjoining states is self-evident."

In contrast, FPL has in the past declined voluntarily to sell power to any municipal utility in Florida. An example of this is the case of Clewiston, intervenor before the Commission, as described in the findings of the Hearing Examiner (R. 2509-2510).[4] Located only three miles from FPL transmission lines, five times it requested a direct connection and service and each time was refused. These requests were made in 1952, 1954, 1957, 1962 and 1965. Moreover, on three of these occasions, in 1954, 1957 and 1965, FPL sought to utilize Clewiston's need for a direct connection to effect a purchase of Clewiston's public system. The Examiner found that it was "contrary to company policy" to "sell to a municipal at wholesale except in the case of furnishing an emergency supply" (R. 2510).

This policy is also reflected in FPL's reluctance to interconnect and exchange power with municipal systems, such as Gainesville. In testifying in opposition to a bill which would have amended the Federal Power Act to eliminate, *inter alia*, FPC jurisdiction over FPL, the representative of the Florida Municipal Utilities Association[5] pointed out:

> "Mr. Robert H. Fite, president of Florida Power & Light Co., in his prepared statement of June 8, 1967, to this committee emphasized that only 1 percent of the company's revenues is derived from wholesale contracts, and that these are only with REA co-ops.

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[4]Clewiston's complaint case against FPL was settled by a settlement eliminating one of the two middlemen between Clewiston and FPL and reducing Clewiston's cost of purchased power by about 30%. (R. 2629, fn. 1). See also, *City of Clewiston v. Florida Power & Light Co.*, 36 FPC 17 (1966).

[5]Comprised of the 34 municipal utilities serving over 1,000,000 people, or about 25% of Florida's population.

> "The reason for this low percentage is simply because Florida Power & Light Co. refuses to sell wholesale power to municipal utilities within reach of its lines; otherwise there would be a much larger percentage of wholesale sales.
>
> "This policy has forced the municipal utilities to rely upon isolated generating systems, and thus both the municipals and FP&L have been deprived of the advantages of energy exchange, pooling, and coordination." (Hearings before the Committee on Commerce, United States Senate, 90th Congress, 1st Session, on S. 1365, June 1967, Serial No. 90-23, p. 167.)

3. Reversal of the holding below is important to eliminate an incentive to FPL (and other utilities in the country) to distort the engineering of their systems in order to escape Commission jurisdiction as permitted by the decision below. Indeed, FPL's actions following issuance of the Commission's order instituting the investigation of FPL's jurisdictional status have contributed heavily to the seriousness of the present reserve shortage problem in Florida. Prior to the Commission's February 26, 1965 Order, FPL was interconnected with Florida Power Corporation (Florida Power) near White Springs, Florida. Florida Power's line ran from that interconnection with FPL to Florida Power's Jasper substation, which connected with Georgia Power Company, providing a flow of interstate energy from Georgia and Florida Power to FPL through the interconnection point near White Springs (R. 83-84). Shortly after the Commission staff in March 1965 conducted its field investigation of the FPL system pursuant to the Commission's February 26 Order (R. 46), FPL on April 23 issued orders for the dismantling of this interconnection (Staff Exhibit No. 17), and FPL reported to the Commission that the tie was dismantled on April 19, 1965.[6]

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[6]For the convenience of the Court, we have reproduced in the appendix the system map set out at page 186 of the joint appendix. Florida Power's lines are those which run southeast from Jasper through Fort White to Sanford. FPL's lines (marked in red) run from

As a result of this dismantling, there is a 5-mile gap between the two systems, with the first connection between the two systems at Sanford, Florida, well down the peninsula. Thus, where once the two systems were connected in a loop with power feeding between both systems at either end of their transmission systems, now the FPL line from Sanford to Live Oak dangles as a radial line.

While this action served FPL's purpose of avoiding Commission jurisdiction under the reasoning of the Court below, it seriously jeopardized the reliability of electric service in Florida. The need for stronger interconnections in Florida was emphasized by the Commission in its July 1969 "Report on Electric Power System Disturbance Affecting the Florida Peninsula January 28, 1969" (p. 12):

> ". . . . very substantial increases in power transfer capability [both interstate to the north and intrastate] are needed to avoid the necessity of shedding load with the loss of a very large generator or generating plant. Obviously, this condition becomes increasingly worse as larger generating units and plants are added to the Florida systems.
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> * * * * *
>
> "Based on the experiences of the January 28 disturbance on the Florida Peninsula network, it is recommended that:
>
> * * * * *
>
> "2. The Florida systems take steps to strengthen network connections within the State and interconnections to the north to meet any requirements for stability as disclosed by studies suggested in the preceding paragraph and to prevent the opening of important tie-lines under conditions, such as those experienced at 6:08 p.m., January 28."

Sanford through Palatka, Starke, Lake City, and terminate at Live Oak. Near Live Oak the lines of the two systems cross, but do not interconnect. The red markings have been added for the purpose of this brief.

The interruption of January 28, 1969 demonstrates the interdependence of the Florida systems. As reported by the FPC in its July 1969 Report on this disturbance (p. 1):

> "The loss of generation caused a sudden increase in power flows through the transmission lines which connect the Florida Power & Light Company to adjacent systems and, thence, to the interconnected network beyond the State's boundary. These increases in flows were sufficiently large that the relay systems designed to protect against equipment failure operated to open the lines and, thereby, disconnect from the nationwide interconnected network all of the interconnected electric utilities in Florida, except for the northern section of the Florida Power Corporation's system. By this separation, most of Florida became an electrical island."

The Report goes on to state that this isolation resulted in a quick decline in system frequency causing relays to automatically shed load on the following systems: Florida Power Corporation, Florida Power & Light Company, City of Jacksonville, Orlando Utilities Commission and Tampa Electric Company. About nine per cent of the total load being supplied by all systems at the time of the disturbance was interrupted.

The system map reproduced in the appendix shows that whereas Florida Power has several interconnections with Georgia Power west of Jennings, Florida, there are no such interconnections with Georgia Power in the area east of Jennings which is served by FPL. Since such lack of interconnection apparently is traceable to FPL's policy to avoid FPC jurisdiction, reinstatement of the Commission holding that FPL is a public utility subject to the Federal Power Act would destroy that reason for FPL's not seeking the interconnections plainly indicated by engineering criteria.

4. The approach of the Court below is patently inconsistent with those of the Sixth, Seventh and Eighth Circuits in *Public Service Co. of Indiana, Inc. v. FPC*, 375 F.2d 100 (7th Cir. 1967), *cert.* denied, 387 U.S. 931; *Cin-*

cinnati Gas & Electric Co. v. FPC, 376 F.2d 506 (6th Cir. 1967), *cert.* denied, 389 U.S. 842; *Indiana & Michigan Electric Co. v. FPC*, 365 F.2d 180 (7th Cir. 1966), *cert.* denied, 385 U.S. 972; *Arkansas Power & Light Co. v. FPC*, 368 F. 2d 376 (8th Cir. 1966).

The Commission in this case has placed heavy reliance upon its findings with regard to "electromagnetic unity."[7] As found by the Commission, subject to the limitation of the interconnections, the power generated by FPL moves in interstate commerce as a result of "electromagnetic unity" with the 140 interconnected utilities making up ISG under which the generating units of the interconnected companies are synchronized and operated in parallel; those generating units, accordingly, are all interlocked electromagnetically with the result that the addition of a load on one part of the system simultaneously affects every generating unit in the system (R. 2501, 2633). The Fifth Circuit brushed these findings aside as inadequate and inconclusive, ruling that (J.A. 364-365):

> "* * * the complex relationship of cause and effect in interconnected and synchronized systems is, as to FPL, not sufficient to prove the actual transmission of energy interstate. It tells us what, as to that company, could occur. It does not tell us with any substantial degree of certainty what does occur.
>
> * * * * *
>
> "* * * The Commission referred * * * to FPL's contribution of 8 mw to ISG during an outage in the midwest. The 'contribution' does not necessarily mean that power was transmitted interstate from FPL to the midwest. Although the effect of FPL's transmission was to increase the total wattage available to the whole system, the 'electromagnetic unity of response' theory is equally compatible with either

[7] The Commission's finding that FPL transmitted power in interstate commerce is also based on the application of the commingling method of tracing (see R. 2503-2505).

> the Commission's 'permeation' assumption or the hypothesis that the power transmitted by FPL was consumed by Corp, another eight mw being passed on by Corp for further use or transmission."

In contrast, in the *Indiana & Michigan* case, the Seventh Circuit, after explaining—in terms closely paralleling those of the Commission and Examiner here—that as an ISG member, the Company's generators operated in electromagnetic unity with those of other ISG members, the Seventh Circuit ruled (365 F.2d at 184):

> "The unpredictable and free-flow of energy in the System in response to any number of constantly changing occurrences, makes it certain, in the view of the Federal Power Commission that out-of-state energy received by I&M at a number of points at or near its eastern, southern or western borders, at one time or another, reaches each of I&M's wholesale customers.
>
> "We hold the Commission was justified, based upon expert opinion evidence and otherwise, in holding the sales by I&M to its wholesale customers were in interstate commerce and were subject to the jurisdiction of the Federal Power Commission.
>
> * * * * *
>
> "We reject I&M's fundamental proposition in this case that in order to prevail, the Federal Power Commission must do what I&M claims to be impossible, that is, to prove by either tracing or some other unnamed 'scientific and engineering proof' that out-of-state energy reaches the wholesale customers. We might recall that even in criminal cases, guilt beyond a reasonable doubt often can be established by circumstantial evidence."

And, in *Public Service of Indiana*, where the Company again was an ISG member and the Commission found, in terms very similar to those in the instant proceeding, that the Company's generators operated in electromagnetic unity with those of the other ISG members (see 34 FPC 1513, 1515-1516), the Sixth Circuit held (375 F.2d at 102-103):

"The ultimate finding of the Commission upon which it asserted jurisdiction is substantially that PSCI's interconnections with other public utilities locates it in a 'large power pool' from which PSCI receives 'large quantities' of out-of-state energy resulting in 'pool sales' subject to Commission regulation.

"PSCI contends that there is no substantial basis in the record for the conclusion that its sales were in interstate commerce because the Commission did not employ point-to-point tracing studies as in many previous cases. The Commission's test, it argues, was an arbitrary nonscientific 'power pool' test, instead of the 'engineering and scientific' test stated by the Supreme Court in Connecticut Light & Power Co. v. FPC, 324 U.S. 515 * * * (1945), and F.P.C. v. Southern Cal. Edison Co., 376 U.S. 205 * * * (1964) (the *Colton* case) * * *.

* * * * *

"* * * We are not persuaded that *Colton* and *Connecticut* are applicable to rule out use by the FPC of the so-called 'power pool' test on the record before us. Scientific evidence can be circumstantial as well as direct.

"The use of the 'power pool' test was approved in both Indiana & Mich. Elec. Co. v. F.P.C., 365 F. 2d 180 (7th Cir. 1966) (I&M), cert. denied, 385 U.S. 972, 87 S. Ct. 509, 17 L.Ed.2d 435 (Dec. 6, 1966), and Arkansas Power & Light Co. v. F.P.C., 368 F.2d 376, 8th Cir., Nov. 7, 1966. In I&M, this court said: 'We think the Commission in holding that the important consideration in determining jurisdiction here is the integrated interstate pool character of the operation.' 365 F.2d at 184. And in *Arkansas*, the court said it was not prepared to say that 'detailed tracing studies are a sine qua non' to federal jurisdiction, where there is an interstate 'pool assist' operation."

The Court below would distinguish these cases primarily on the ground that they involved Commission jurisdiction

over sales for resale, whereas here the Commission's assertion of jurisdiction is only over transmission by FPL. But this factual difference does not have the legal consequences asserted by the Court below. In both situations, the basic issue concerned the existence of "interstate commerce" within Section 201(b) of the Federal Power Act. Patently, the principles in which the Courts found interstate commerce in the *Indiana & Michigan* line of cases are also pertinent to the determination whether FPL's transmission of power here is in interstate commerce.

The invalidity of the Court's distinction is further evident from this Court's decision in *FPC v. East Ohio Gas Co.*, 338 U.S. 464 (1950). In affirming in that case the Commission's holding that a company which transported within a single state, but did not sell for resale, gas moving in interstate commerce was subject to its jurisdiction under the parallel provision of the Natural Gas Act, this Court noted (*Id.* at 468):

> "As we pointed out in Panhandle Eastern Pipe Line Co. v. Public Service Comm., 332 U.S. 507, 516, * * * §1(b) made the Natural Gas Act applicable to three separate things: '(1) the transportation of natural gas in interstate commerce; (2) its sale in interstate commerce for resale; and (3) natural gas companies engaged in such transportation or sale.' *And throughout the Act 'transportation' and 'sale' are viewed as separate subjects of regulation. They have independent and equally important places in the Act.*" (Emphasis supplied.)

CONCLUSION

For the foregoing reasons, this Court should set aside the judgment of the Court of Appeals and direct the entry of an order affirming in full the order of the Commission.

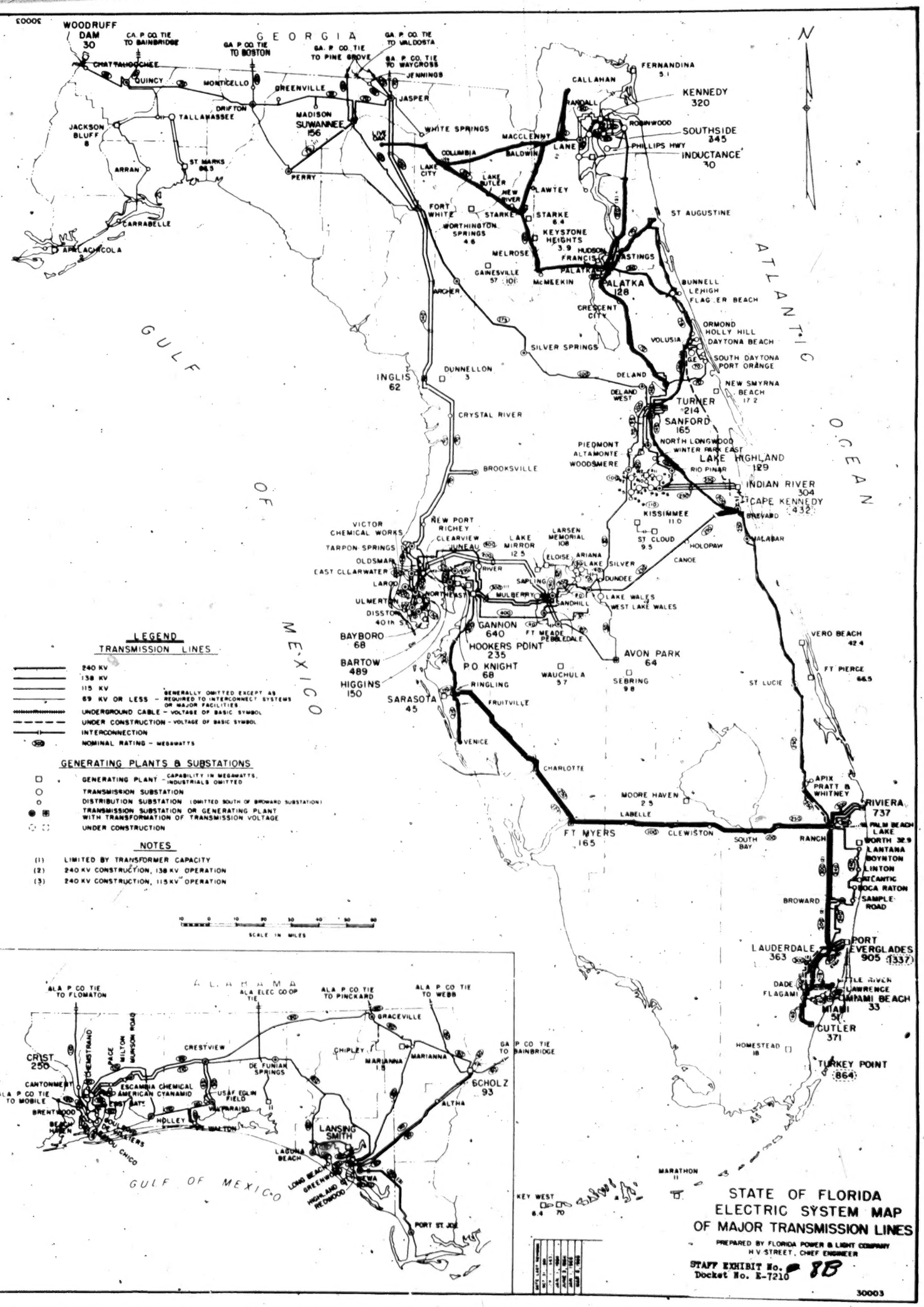
Respectfully submitted,

GEORGE SPIEGEL
SANDRA J. STREBEL
JAMES F. FAIRMAN, JR.
2600 Virginia Avenue, N.W.
Washington, D.C. 20037

MELVIN RICHTER
1001 Connecticut Ave., N.W.
Washington, D.C. 20036

Attorneys for Amicus Curiae

May, 1971


WOODRUFF DAM 30
CA. P CO. TIE TO BAINBRIDGE
GA P CO TIE TO BOSTON
GA. P CO. TIE TO PINE GROVE
GA P CO. TIE TO VALDOSTA
GA P CO TIE TO WAYCROSS
GEORGIA
CHATTAHOOCHEE
QUINCY
MONTICELLO
GREENVILLE
JASPER
JENNINGS
DRIFTON
TALLAHASSEE
JACKSON BLUFF 8
MADISON SUWANNEE 156
WHITE SPRINGS
LOVE OAK
ARRAN
ST MARKS 84.5
PERRY
LAKE CITY
COLUMBIA
BALDWIN
MACCLENNY
LANE
CALLAHAN
FERNANDINA 5.1
KENNEDY 320
RANDALL
ROBINWOOD
SOUTHSIDE 345
PHILLIPS HWY
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LAKE BUTLER
NEW RIVER
LAWTEY
FORT WHITE
STARKE
STARKE 6.4
WORTHINGTON SPRINGS 4.6
KEYSTONE HEIGHTS 3.9
HUDSON
FRANCIS
HASTINGS
ST AUGUSTINE
CARRABELLE
APALACHICOLA
MELROSE
GAINESVILLE 57 101
McMEEKIN
PALATKA
PALATKA 128
BUNNELL
LEHIGH
FLAGLER BEACH
ARCHER
CRESCENT CITY
ORMOND
HOLLY HILL
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KISSIMMEE 11.0
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ST CLOUD 9.5
HOLOPAW
MALABAR
TARPON SPRINGS
OLDSMAR
ELOISE
ARIANA
LAKE SILVER
CANOE
EAST CLEARWATER
LAROD
SAPLING
DUNDEE
ULMERTON
NORTHEAST
MULBERRY
LAKE WALES
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VERO BEACH 42.4
FT PIERCE 66.5
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HIGGINS 150
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RINGLING
FRUITVILLE
VENICE
CHARLOTTE
APIX
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MOORE HAVEN 2.5
LABELLE
FT MYERS 165
CLEWISTON
SOUTH BAY
RANCH
PALM BEACH
LAKE WORTH 32.9
LANTANA
BOYNTON
LINTON
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CRIST 250
CHEMSTRAND
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PREPARED BY FLORIDA POWER & LIGHT COMPANY
H.V. STREET, CHIEF ENGINEER
STAFF EXHIBIT No. 8B
Docket No. E-7210
30003

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In the Supreme Court of the United States

OCTOBER TERM, 1970

FEDERAL POWER COMMISSION, PETITIONER

v.

FLORIDA POWER & LIGHT COMPANY

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FIFTH CIRCUIT

BRIEF FOR THE FEDERAL POWER COMMISSION

ERWIN N. GRISWOLD,
Solicitor General,
SAMUEL HUNTINGTON,
Assistant to the Solicitor General,
Department of Justice,
Washington, D.C. 20530.

GORDON GOOCH,
General Counsel,
DREXEL D. JOURNEY,
Deputy General Counsel,
DAVID F. STOVER,
Attorney,
Federal Power Commission,
Washington, D.C. 20426.

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In the Supreme Court of the United States

OCTOBER TERM, 1970

No. 958

FEDERAL POWER COMMISSION, PETITIONER

v.

FLORIDA POWER & LIGHT COMPANY

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FIFTH CIRCUIT

BRIEF FOR THE FEDERAL POWER COMMISSION

OPINIONS BELOW

The opinion of the court of appeals (App. 354–374) is reported at 430 F. 2d 1377. The opinion and orders of the Federal Power Commission (App. 251–254, 283–306, 327–329, 329–330) are reported at 37 F.P.C. 544 and 37 F.P.C. 833. The opinion of the hearing examiner (App. 254–282) is reported at 37 F.P.C. 560.

JURISDICTION

The judgment of the court of appeals was entered on July 13, 1970 (App. 375). By order dated October 5, 1970, Mr. Justice Black extended the time within which to file a petition for a writ of certiorari to November 10, 1970, and the petition was filed on that

date. The petition was granted on February 22, 1971 (App. 376). The jurisdiction of this Court is invoked under 28 U.S.C. 1254(1) and Section 313(b) of the Federal Power Act (16 U.S.C. 825*l*(b)).

QUESTION PRESENTED

Whether the Federal Power Commission properly determined that the interconnection of an electric power utility with an interstate transmission grid involved "transmission of electric energy in interstate commerce" and thus made the utility subject to the Commission's regulatory jurisdiction.

STATUTE INVOLVED

Section 201 of the Federal Power Act, as added, 49 Stat. 847 (16 U.S.C. 824), provides in pertinent part:

* * * * *

> (b) The provisions of this Part shall apply to the transmission of electric energy in interstate commerce and to the sale of electric energy at wholesale in interstate commerce, but shall not apply to any other sale of electric energy or deprive a State or State commission of its lawful authority now exercised over the exportation of hydroelectric energy which is transmitted across a State line. The Commission shall have jurisdiction over all facilities for such transmission or sale of electric energy, but shall not have jurisdiction, except as specifically provided in this Part and the Part next following, over facilities used for the generation of electric energy or over facilities used in local distribution or only for the transmission of electric energy in intrastate commerce,

or over facilities for the transmission of electric energy consumed wholly by the transmitter.

(c) For the purpose of this Part, electric energy shall be held to be transmitted in interstate commerce if transmitted from a State and consumed at any point outside thereof; but only insofar as such transmission takes place within the United States.

* * * * *

(e) The term "public utility" when used in this Part or in the Part next following means any person who owns or operates facilities subject to the jurisdiction of the Commission under this Part.

STATEMENT

This case involves the Federal Power Commission's determination that the Florida Power & Light Company ("FPL") owns and operates facilities for the transmission of electric energy in interstate commerce and thus is subject to the Commission's jurisdiction under Section 201 of the Federal Power Act, 16 U.S.C. 824. Although the only immediate impact of the determination would be to require FPL to follow the Commission's Uniform System of Accounts, the establishment of jurisdiction would empower the Commission, under appropriate circumstances, to direct FPL to interconnect with and sell power to other utilities or distributors, thereby improving the reliability of service to consumers, and would enable the Commission to regulate FPL's future sales of interstate power at wholesale. The court of appeals reversed the order of the Commission, rejecting the methods adopted by the Commission in determining that FPL transmits electricity in interstate commerce.

A. THE ELECTRIC UTILITY SYSTEMS INVOLVED

FPL. The facts developed before the Commission in the administrative proceeding initiated in 1965 (App. 251) show that FPL owns and operates extensive generation, transmission and distribution facilities providing retail and wholesale electric energy in southern and eastern Florida; it is the largest electric utility in the state and ninth in the nation in terms of revenues.[1] FPL operates ten steam-electric generating facilities with a net dependable generating capacity of 2.8 million kilowatts, has a 2,600 mile transmission grid and serves about 931,400 customers (App. 9–11). While all the company's facilities are physically located within Florida and none extend to the state line, FPL is interconnected with the Florida Power Corporation ("Corp"), which has several transmission connections at the Georgia state line (App. 14, 191).

The Florida Operating Committee. In addition to its interconnections with Corp, FPL is joined with three other Florida electric utilities—Tampa Electric Company ("Tampa"), Orlando Utilities Commission ("Orlando") and the City of Jacksonville ("Jacksonville") (App. 11, 12, 286). FPL, Corp and Tampa form the Florida Operating Committee with Orlando and Jacksonville as associate members (App. 189, 286). The members of the Committee coordinate the installation and maintenance of their generating facilities (App. 23–24), and the Committee meets several times a year to discuss mutual problems relating to their interconnected operations.

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[1] Unless otherwise indicated, the figures throughout the brief are for 1964.

Although during normal periods of operation FPL's generating capacity is sufficient to meet its loads and the output of its generators is controlled by computer to match the ever changing combined total of such loads (App. 71, 72, 257), FPL depends upon the other members of the Committee for emergency power (App. 23–24, 32). In a report to the Commission for the year 1964, FPL acknowledged this reliance on other Committee members for reserves; to meet a required reserve generating capacity (as defined by the reporting form, FPC Form 12) of 404,000 kilowatts, FPL listed 172,000 kilowatts from its own generating facilities and 232,000 kilowatts from the facilities of other Committee members (App. 32, 286).

As a result of interconnected operations, substantial quantities of electric energy are interchanged among Committee members (App. 185). These interchanges are either scheduled or inadvertent. Scheduled interchanges take place after consultations among the respective system dispatchers to meet the power needs of particular members.[2] Inadvertent interchanges of energy include both intentional interchanges resulting from the operation of frequency bias (see pp. 9–10, *infra*) and unscheduled interchanges resulting from human or equipment error (App. 203–210, 259). Both scheduled and inadvertent interchanges—usually taking place concurrently (App.

[2] The Florida utilities do not engage, as do some electric pools, in scheduled interchanges for economy purposes to take advantage of differences among utilities in incremental costs of producing power.

203–210)—are measured, netted and paid for as necessary at regular intervals (App. 109–110, 258–259).

Corp's relationship with the Southern Company System. Corp (which is interconnected with FPL) is interconnected across the Georgia-Florida state line with the Georgia Power Company ("Georgia") (App. 191), a subsidiary of the Southern Company whose other subsidiaries are the Gulf Power Company ("Gulf") operating in northwestern Florida, the Alabama Power Company ("Alabama") and the Mississippi Power Company (App. 14, 286–287). Corp also has interconnections with Gulf, which in turn has interconnections with Alabama and Georgia (App. 38, 189, 287). Georgia is interconnected with the Duke Power Company, the Tennessee Valley Authority and the Southeastern Power Administration, which systems operate in states beyond Georgia (App. 287–288).

Pursuant to an agreement, Corp makes available to the Southern Company subsidiaries 100,000 kilowatts of its generating capacity during the summer in return for Southern's contribution of 100,000 kilowatts of capacity to Corp in the winter (App. 287). During 1964, Corp delivered to Southern 157 million kilowatt-hours (kwh) of electric energy, of which 82 million were delivered to Georgia; Southern, in turn, sent 167 million kwh to Corp, of which 97 million came from Georgia (*ibid.*). On many occasions during the year, including peak load periods, there was a flow in both directions during a 24-hour period over the Corp-Georgia interconnections (App. 260). The Southern Company utilities also wheeled (transmitted across their territories) 3.9 million kwh from the South-

western Power Administration across the Georgia-Florida state line to Corp (*ibid.*).

The Interconnected Systems Group. All of the power companies mentioned thus far, including FPL, are among the 140 interconnected utilities making up the voluntary Interconnected Systems Group ("ISG") spanning the southeastern and central portions of the United States (App. 12–13, 187, 188, 288). By virtue of their interconnection, the 140 ISG members operate in synchronism and render each other emergency assistance when needed (App. 13, 41, 288). For example, the record shows one instance in 1965 when FPL contributed, through its interconnection with Corp, 8 megawatts of generating capacity to meet a 580 megawatt loss of generation on a midwestern system (App. 21–22, 288, 347).

B. THE INTERDEPENDENCE OF FPL AND THE OTHER ISG UTILITIES AS A BASIS FOR JURISDICTION—THE "ELECTROMAGNETIC UNITY" THEORY

It is undisputed that Commission jurisdiction over FPL is established if FPL's facilities transmit electric energy "in interstate commerce" within the meaning of Section 201(b) of the Federal Power Act; Section 201(c) states that electric energy shall be deemed to be transmitted in interstate commerce "if transmitted from a State and consumed at any point outside thereof * * *." In an effort to meet the burden of establishing that transmission had indeed taken place between FPL and Georgia, the Commission's staff presented evidence in the administrative proceeding showing that all elements of an interconnected

electric network are physically interdependent in that the occurrence of an event on one part of the network affects every element of the entire system. In substance, the staff's evidence was as follows:

Electric power on the FPL, Corp, Georgia and other ISG systems is supplied as alternating current at an average frequency of 60 cycles per second. Because the systems necessarily operate in synchronism or "parallel," the frequencies on the systems correspond exactly; all generating units connected to the common network experience the same changes in frequency and all electric clocks connected to such a network keep precisely the same time (App. 35, 38–39).

All the electric energy produced by all of the generators of the members of ISG (or any interconnected network) is delivered to the common, integrated transmission grid of the network, from which all of the network's customers are served (App. 35). As there is no way of storing electric energy, the total generation of a network is constantly adjusting to match the network's total load (App. 39).[3] In order

[3] When a load is added suddenly to a network (or when there is a sudden outage of a generating unit) each generating unit on the network almost instantly experiences a loss of speed as a portion of the mechanical energy of rotation of each generator is converted into additional electric energy (App. 40–41, 137). The aggregate of such conversions supplies the added electric energy needed to supply the load or make up for the generating outage (App. 41). Following this initial reaction, the governors on some generators will react in accordance with frequency bias (see pp. 9–10, *infra*) to cause additional steam to be applied to the turbines thereby speeding up those generators, producing more energy and returning the network frequency to normal (App. 137–138). When loads are removed from the network, the same procedure oper-

to assure that loads of a given member of the ISG are met ultimately by generation on that member's system or a neighboring system with which the member has special arrangements, and in order to assure that frequency is maintained as close to 60 cycles per second as possible, each system employs what is known as tie line[4] control with frequency bias.

FPL's tie line control (like that of the other systems) involves the programming of FPL's dispatching computer to direct FPL's generators to produce enough electric energy to supply FPL's loads and transmission losses plus FPL's scheduled net interchange of energy to the other members of the Florida Operating Committee (App. 32–34, 36–37).[5] Frequency bias acts to shift net interchange schedules automatically with changes in frequency; a reduction in frequency leads to an increase in each system's net interchange obligation (*i.e.*, each system must increase its generation to restore the 60 cycle frequency) and an increase in frequency conversely leads to a reduction of each system's net interchange obligation (App. 34–38, 139–141).

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ates in reverse: generators initially speed up as no longer needed electric energy is converted to mechanical energy, governors react to reduce steam and the generators slow down, returning frequency to 60 cycles per second.

[4] A tie line is a transmission line connecting different electric systems.

[5] Scheduled interchanges are always "net" as the actual moment-to-moment flows of power within a given system or between systems cannot be controlled. As a result, net interchanges are not scheduled for a particular tie line; only the net of inflows and outflows over all of a system's tie lines is controlled (App. 32–38).

The mechanics of tie line control with frequency bias can best be illustrated by a simple, hypothetical example. Assume that the ISG network is in balance with frequency at 60 cycles per second, with total generation matching total load plus losses and with all scheduled net interchanges being met. If a load is now added to the FPL system with no other changes on the entire network, the following sequence of events will occur: First, an almost instantaneous drop of frequency and generator speed will occur throughout the network as a portion of the mechanical energy of rotation of every generator is converted into electric energy to meet the load. This drop in frequency will automatically increase each constituent system's net interchange obligation.[6] Each system including FPL will then begin to increase its generation to comply with its proportionate new net interchange obligation so as to restore the 60 cycle frequency. FPL must in addition eventually increase its generation by the amount of the load added to its system, so that the frequency may be retained at 60 cycles with all interchange values returned to their scheduled levels.[7]

[6] ISG recommends that its members set their frequency bias so that for each drop in frequency of one-tenth of a cycle per second on the interconnected network, the net interchange obligation of the member will increase by an amount equal to one percent of the member's annual peak load (App. 36–37, 141, 334). Thus, each member contributes to emergencies and helps regulate frequency in proportion to the size of its system.

[7] If for some reason FPL was unable to meet its new load or to replace lost generation, an FPL dispatcher would arrange for the load or generation loss to be met by a neighboring system and scheduled net interchange values would be reset

A staff witness explained the benefits which accrue to a member of an interconnected network (App. 41–42). Because of the magnitude of the system, deviations in frequency from 60 cycles per second are kept to a minimum. As a result, transfers of non-scheduled energy between systems and unnecessary speed-ups and slow-downs of generating equipment are also minimized, clocks keep more nearly perfect time and many precision industrial operations are improved (*ibid.*). Of equal importance, FPL receives automatic assistance during emergencies, including assistance from the non-Florida ISG utilities up to the 100 megawatt capacity of the Corp-Georgia tie line (App. 41, 288).

In short, FPL operates in "electromagnetic unity" (App. 38–39) with the other members of the ISG system and receives significant benefits from such operation.

C. THE TRACING OF ELECTRIC ENERGY AS A BASIS FOR JURISDICTION—THE "COMMINGLED METHOD" VERSUS THE "SYSTEMS STUDY METHOD"

As an alternate basis for showing interstate transmissions over FPL's facilities, the staff utilized a method of tracing power flows known as the "commingled method." Two studies were offered by the staff. The first analyzed data from FPL's and Corp's commercial meters to show that, during designated

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accordingly. During the time it might take the dispatcher to complete the transaction, the load or loss of generation would be met by all ISG members operating under frequency bias (App. 140–141).

hours on each of 22 days in a four-month period in 1964, electric energy flowed from Georgia to FPL over Corp's facilities, becoming commingled en route with energy from other sources at one or more Corp buses[8] (App. 15–21, 191–202). A second study similarly showed that, during designated hours on three summer days in the same year, electric energy flowed from FPL through Corp—where it was also commingled with energy from other sources—to Georgia (App. 53–56, 211–226).

In rebuttal of the staff's case, an FPL witness contended that the "systems study method" of tracing power flows was preferable to the commingled method (App. 83–86). Using systems study principles, the witness examined the staff studies and concluded that electric energy had not flowed from Georgia to FPL or from FPL to Georgia during the designated periods (App. 86–92).

A staff witness, Dr. Joseph Jessel, explained the basic concepts and assumptions underlying the different tracing methods (App. 45–51). He acknowledged that both methods employed rough approximations and simplifications of an actual electric power system (App. 49) in order to make use of the data available from the commercial meters used by utilities (App. 44–54, 150). Because commercial meters measure only average values, they fail to reflect the fact that power flows in positive and negative pulses in each phase of

[8] A bus is a set of three conductive bars used to join together two or more transmission lines.

the three phase alternating current system employed by all modern utilities (App. 42–45).[9]

The basic difference between the two tracing systems lies in their treatment of the bus. Under the commingled method, each bus is treated as a single point or reservoir so that power entering the bus on one transmission line is considered to be commingled with power entering on all other transmission lines and thus is deemed present ratably on each outgoing circuit[10] (App. 48–49, 165). The systems study method, on the other hand, represents a bus as a single conductor with physical dimensions and seeks to trace net power flows within the bus (App. 165). Dr. Jessel gave his opinion that the commingled method of tracing more nearly represents an actual three phase electric power system because, by treating a bus as a point, it in effect takes into account the fact that power pulses back and forth on each phase of an actual bus (App. 49, 146–147). Dr. Jessel also

[9] Each phase of three phase power is transmitted separately from generator to distribution point. Transmission lines thus come in threes, which accounts for the three bars of each bus—one bar for each phase. At several points during the proceedings, Dr. Jessel elaborated on the nature of three phase power and the problems of suitably representing it for tracing purposes (See App. 43–44, 131–155, 163–175, 240).

[10] To illustrate, Dr. Jessel hypothesized (App. 49):

> * * * [I]f circuit A contributes 60 percent of the incoming power to the junction point and circuit B contributes 40 percent of the incoming power to the junction point, then the distribution of power in each outgoing circuit is comprised of 60 percent A power and 40 percent B power, uniformly commingled.

noted that the commingled method had been used in other power flow studies presented at formal Commission proceedings (App. 47).

D. THE HEARING EXAMINER AND COMMISSION DECISIONS

The hearing examiner issued an initial decision in July 1966 (App. 254–282). Analyzing in considerable detail the evidence on the interdependence and synchronization of power utilities forming an interconnected system (App. 262–270), he found FPL's generators were interlocked electromagnetically with Georgia's, responding automatically and almost instantaneously to increases of load on Georgia's system and thereby reducing frequency variations and increasing the Georgia system's efficiency (App. 270). He noted that, if sensitive enough instruments were available, the response of FPL's generators to the turning on of a light on the Georgia system could be measured (App. 269). The hearing examiner concluded that (App. 270):

> The cause and effect relationship in electric energy occurring throughout every generator and point on the Georgia, Corp and [FPL] systems constitutes interstate transmission of electric energy by, to, and from [FPL]. It is the electromagnetic unity of response of [FPL], Corp, Georgia and other interconnecting systems that constitutes the interstate transmission of electric energy by [FPL].

The hearing examiner went on to consider the staff's tracing studies as an alternative basis for jurisdiction (App. 271–274), noting at the outset that the nature

of electric energy is not fully understood (App. 271) and that all tracing methods "transpose the complex dynamism of modern alternating current electric systems into simplified models on the basis of numerous assumptions" (App. 272). The examiner focused on the distinctive treatments of a bus by the commingled and systems study tracing methods (App. 272) and concluded that the commingled method's treatment of a bus as a point was more in consonance with the physics of transmission of alternating current than the systems study method's treatment of a bus as a single bar with physical dimensions (App. 272–274).[11] Having accepted the commingled method, the examiner found that the staff had proved the transmission of electric energy between FPL and Georgia over Corp's facilities (App. 274). The examiner accordingly found FPL to be subject to the Commission's jurisdiction and thus required to comply with the Commission's regulations under the Act (App. 282).[12] In an opinion issued in March 1967 (App. 283–300), the Commission affirmed the examiner's decision in substantially all respects. Two of the five Commissioners dissented (App. 301–306).

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[11] The examiner observed that the systems study tracing method might be useful for some types of engineering studies, where all that is desired is a mathematical answer, regardless of the physical dynamics of the situation (App. 273–274).

[12] In response to other contentions made by FPL, the examiner found that the facilities involved did not fall within the "local distribution" exemption of Section 201(b) (16 U.S.C. §824(b)), and that compliance with the Commission's accounting requirements would not be unduly costly or burdensome (App. 274–279).

E. THE COURT OF APPEALS DECISION

On review, the court of appeals reversed the Commission's order (App. 354–374), holding that the electromagnetic unity theory was insufficient, standing alone, to prove that power flowing from Corp to Georgia, whether scheduled or unscheduled, contained power generated by FPL, or that power flowing from Corp to FPL contained power generated outside of Florida (App. 364). As to the commingled tracing method, the court emphasized that the flow of electric energy was "not yet fully explainable" (App. 365) and held that the "engineering and scientific fact test for interstate flow of energy is not met by postulating a simplified characterization of how, for various purposes of convenience, energy may be treated as flowing" (App. 367–368). It distinguished the prior court of appeals cases upholding Commission jurisdiction over sales at wholesale (see pp. 27–31, *infra*) on the ground that in each of those cases the utility had concededly received interstate power, the only issue being whether such power reached specific customers; it found this case different because it involves the more fundamental question of whether FPL is subject to the provisions of the Federal Power Act at all (App. 368–373).

SUMMARY OF ARGUMENT

The legislative history of the Federal Power Act amendments of 1935, adopted in the wake of *Public Utilities Commission* v. *Attleboro Steam & Electric Co.*, 273 U.S. 83, shows that Congress was seeking to secure the planned coordination of interconnected

electric facilities and to regulate sales at wholesale of interstate electric energy placed beyond state regulatory authority by the *Attleboro* decision, all without unnecessary impairment of the authority of state regulatory commissions. Section 201 of the Federal Power Act reflects the various concerns of Congress. Commission jurisdiction over facilities for the transmission of electric energy in interstate commerce is established with precision—to be determined by an "engineering and scientific" fact test. *Connecticut Light & Power Co.* v. *Federal Power Commission,* 324 U.S. 515, 529. At the same time, general exemptions were provided to protect state authority. The issue presented by this case is whether the Commission's determination that FPL's facilities are used for the transmission of electric energy in interstate commerce, as a matter of scientific fact, was supported by substantial evidence. We submit that the Commission's determination, based on two alternative approaches, was supported by substantial evidence and that the court of appeals improperly substituted its own views for the Commission's expert decision.

A

There was substantial evidence in the record to support the Commission's conclusions that the electromagnetic unity of response of FPL and the other members of the multi-state Interconnected Systems Group constituted the interstate transmission of electric energy. The staff introduced expert evidence to the effect that all of the elements of an interconnected interstate electrical network are locked together in

electromagnetic unity and that the addition of a load to one part of the network would almost instantaneously effect every generator on the network. Other evidence concentrated on the degree of coordination of operations among FPL and its neighbors. In short, the evidence supported the conclusion that FPL was an integral part of a vast interstate network and received substantial benefits from its association.

Recent court of appeals decisions have approved basing Commission jurisdiction on the realities of interconnected electric utility operation in multi-state areas, without resort to the tracing of power flows. The Commission has noted that the nature of highly complex modern electric systems makes tracing impracticable in many instances and "irrelevant to present day power system technology". *Arkansas Power & Light Co.*, 34 F.P.C. 747, 751. The attempt of the court below to distinguish those decisions of other courts of appeals on the grounds that they all involved jurisdiction over sales at wholesale falls short of the mark; Congress employed the same factual standard for establishing jurisdiction over particular sales of electric energy at wholesale as it did for establishing plenary jurisdiction over individual utilities.

B

The Commission's acceptance of the staff's tracing studies, which were based on the commingled tracing method and showed that power had on occasion flowed from Georgia to FPL and from FPL to Georgia, was an adequate, independent basis for the assertion of

jurisdiction over FPL in this case. Although tracing is not always practicable at the present stage of electric technology, the staff was able to complete a study here. The use of the commingled tracing method was justified by expert testimony which established that the method's treatment of a bus as a point took into account the realities—as nearly as they are known—of three phase power transmission. The commingled method has in the past been employed with court approval in jurisdictional cases.

ARGUMENT

I. INTRODUCTION

Part II of the Federal Power Act (Sections 201–209, 16 U.S.C. 824–824h) was added in 1935, 49 Stat. 847, to bring interstate transmissions and sales of electric energy under federal regulation following this Court's decision in *Public Utilities Commission* v. *Attleboro Steam & Electric Co.*, 273 U.S. 83, that interstate sales at wholesale were beyond the reach of state regulatory authorities.[13] As is shown by the legislative history, the amended Act sought to accommodate two competing aims. On the one hand, Congress recognized the rapid growth of the electric power industry into vast interstate systems and the necessity for federal leadership in coordinating facilities. S. Rep. No. 621, 74th Cong., 1st Sess., pp. 17–18. The report of the Senate Committee on Interstate Commerce noted (*id.* at p. 48):

[13] The interstate transmission involved in *Attleboro* was a direct transmission between two utilities located in different states.

> It is obvious that no steps can be taken to secure the planned coordination of [the electric] industry on a regional scale unless all of the facilities, other than those used solely for retail distribution, are made subject to the jurisdiction of the [Federal Power] Commission.

On the other hand, Congress also made clear its intention not to interfere unduly with the powers of state regulatory commissions and to extend federal authority only to those matters which could not effectively be controlled by the states. *Ibid.*; see Section 201(a) of the Act.

Section 201 of the Act, as finally enacted, reflects those competing concerns of Congress. Thus, general Commission jurisdiction over utilities is defined broadly and with precision: The Commission is given jurisdiction over "all facilities" used for the transmission or sale of electric energy "in interstate commerce" (Section 201(b)); energy transmitted in interstate commerce is defined as energy "transmitted from a State and consumed at any point outside thereof" (Section 201(c)); and any person who owns or operates any such facilities is a "public utility" subject to various other provisions of the Act (Section 201(e)). While precise, the above definitions did not adequately recognize the expressed concern of Congress that state regulatory authority not be unduly impaired. Accordingly, terms of somewhat less precision, see *Connecticut Light & Power Co.* v. *Federal Power Commission,* 324 U.S. 515, 529–531, were used to limit the Commission's jurisdiction; exemp-

tions were created for facilities used in "local distribution" and facilities used only for the transmission of energy in intrastate commerce or for the transmission of energy consumed wholly by the transmitter (Section 201(b)). Finally, and most important, the Commission's rate jurisdiction over interstate sales was limited to sales at wholesale (*ibid.*); no authority over retail sales was granted.

The question presented in this case is whether FPL's facilities are used for the transmission of electric energy "in interstate commerce" so as to make FPL a "public utility" within the meaning of the Act. It is thus necessary to determine the meaning of the phrase "in interstate commerce."

In the first case to reach this Court under Section 201, *Jersey Central Power & Light Co.* v. *Federal Power Commission,* 319 U.S. 61, 70–71, a utility seeking to escape the jurisdiction of the Commission argued that the phrase "in interstate commerce" established a very restrictive test of jurisdiction; comparison was made to phrases such as "affecting commerce" or the "current of commerce" used in other regulatory statutes. The Court rejected such comparisons as tools for determining the scope of "in interstate commerce," noting that the phrase was precisely defined by the Act itself. 319 U.S. at 70–71. This view of the jurisdictional standard embodied in Section 201 was confirmed by this Court in *Connecticut Light & Power Co.* v. *Federal Power Commission, supra,* 324 U.S. at 529–531, where it was noted that

the "terms of the grant of federal power," as opposed to the terms of limitation employed by Congress to limit jurisdiction, were (324 U.S. at 529):

> * * * couched largely in the technical language of the electric art. Federal jurisdiction was to follow the flow of electric energy, an engineering and scientific, rather than a legalistic or governmental, test. * * *

See also *Federal Power Commission* v. *Southern California Edison Co.*, 376 U.S. 205, 209 n. 5, 215. Thus, the existence or absence of Commission jurisdiction over FPL turns on an analysis of the "engineering and scientific" data contained in the record before the Commission, an analysis the Commission is especially qualified to undertake.

Before turning to the bases for jurisdiction found by the Commission, we reemphasize the significance of this jurisdictional case. As noted, Congress was fully aware of the need for regional planning and coordination of electric systems when it passed the Federal Power Act amendments in 1935. But at that time only a fraction of the nation's systems were interconnected in interstate networks; since that time, interconnection has progressed markedly and the nation's bulk power systems are now being linked from coast to coast. Accordingly, in the words of the Commission, "the interstate nature of the electric business, and the need for Federal regulation, have steadily risen." Federal Power Commission Report on S. 1365, 90th Cong.,

printed in Hearings on S. 1365 before the Senate Committee on Commerce, 90th Cong., 1st Sess., p. 5.[14] See also Hearings on H.R. 5348 before Subcommittee on Communications and Power of the House Committee on Interstate and Foreign Commerce, 90th Cong., 1st Sess., p. 118.[15]

The only immediate effect of the Commission's order in this case will be to require FPL to follow the Commission's Uniform System of Accounts, thereby subjecting FPL's operations to regulatory and public scrutiny on the same basis as the operations of other utilities. The establishment of jurisdiction over FPL would, however, empower the Commission to order FPL to interconnect with other utilities under certain circumstances, thus improving reliability of service and making possible economies for both parties to the interconnection. See Section 202 of the Act and our brief in *Federal Power Commission* v. *Florida Power Corp.*, No. 469, 1970 Term, argued February 24, 1971. Commission jurisdiction would also subject FPL's wholesale rates for any future interstate power

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[14] S. 1365 was introduced by Senators Holland and Smathers of Florida following the Commission's decision in this case and would have exempted from Commission jurisdiction any utility whose facilities were located entirely within one state and which did not transmit or receive electric energy by direct interconnection from or to any other state or by indirect connection except for temporary or emergency purposes. The bill was never reported out of committee.

[15] H.R. 5348, although differing slightly in language, was the companion bill to S. 1365. See n. 14, *supra*. It too was never reported out of committee.

sales to regulation and FPL would be prohibited from granting undue preference to its wholesale customers as a class or discriminating among them individually (Sections 201(b) and 205). Finally, FPL would also be subject to the provisions of Sections 203 and 204 of the Act, requiring Commission approval of mergers, acquisitions and the issuance of securities, as well as the reporting and other requirements of Part III of the Act, Sections 301–319, 16 U.S.C. 825–825r.

In short, the establishment of jurisdiction in this case will subject one of the nation's largest electric utilities to the specific requirements of the Federal Power Act adopted by Congress to promote the coordinated and efficient deployment of the vast system of interconnected electric facilities which are necessary to meet the nation's power demands. And it will give the Commission the same authority over other similarly situated utilities.

II. SUBSTANTIAL EVIDENCE SUPPORTS THE COMMISSION'S DETERMINATION THAT TRANSMISSION OF ELECTRIC ENERGY BETWEEN FPL AND INTERCONNECTED SYSTEMS IN OTHER STATES IS ESTABLISHED BY THEIR ELECTROMAGNETIC UNITY OF RESPONSE

The question whether FPL owns and operates facilities for the transmission of electric energy "in interstate commerce" as that phrase is used and defined in Section 201 of the Federal Power Act is, as we have seen (pp. 21–22, *supra*), a question of "engineering and scientific" fact. The only inquiry on judicial review is whether the Commission's finding of the existence of that fact was supported by substan-

tial evidence. See Section 313(b) of the Act; *Federal Power Commission* v. *Southern California Edison Co.*, 376 U.S. 205, 209 n. 5. An analysis of the record shows that there was an abundance of engineering and scientific data to support the Commission's expert conclusion.

As we have set forth in some detail in the Statement (see pp. 7–11, *supra*), the expert evidence introduced before the Commission by the staff established that all of the elements of the interconnected interstate network of which FPL, Corp and Georgia are a part are locked together in electromagnetic unity. Thus, FPL, Corp and Georgia operate in synchronism—*i.e.*, precisely at the same frequency—and the addition of a load or the outage of a generator on one system evokes an almost instantaneous response on the other systems as all generators automatically slow down to provide the additional power necessary to meet the load. The hearing examiner's conclusion that this cause and effect relationship constitutes interstate transmission of electric energy (App. 270) reflects the physical reality of the situation. Clearly, for a generator in one state to alter its mode of operation by reason of the addition of a load in another state, an appropriate signal must be transmitted from the load to the generator. The signal—an electric impulse—is none other than a quantum of electric energy originating in one state and consumed in another.[16]

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[16] Compare *Pantomimic Corp.* v. *Malone*, 238 Fed. 135 (C.C.A. 2), where a corporation sought to get around a statute barring the importation of prize fight films by setting up a camera

The staff evidence, however, was not limited to the bare cause and effect relationship among interconnected facilities, but also concentrated on the degree of coordination of operations among FPL, the other members of the Florida Operating Committee and the other utilities forming the Interconnected Systems Group (see pp. 4–11, *supra*). The substantial interchanges of electric energy among FPL and other Committee members and between Corp and Georgia, the reliance by FPL on other systems for emergency power, and the common use by all ISG members of tie line control with frequency bias to regulate network frequency and to provide almost instantaneous emergency service, all support the conclusion that FPL is an integral part of a vast, coordinated interstate network. This evidence, together with the evidence on the electromagnetic unity of response, fully supports the Commission's conclusion that FPL does, in fact, own facilities for the transmission of electric energy in interstate commerce, *i.e.*, in the words of Section 201(c) of the Act, energy "transmitted from a State and consumed at any point outside thereof."

This Court's dictum in *Jersey Central Power & Light Co.* v. *Federal Power Commission*, 319 U.S. 61, 72, that "[m]ere connection determines nothing" does not compel a rejection of the Commission's determination here. In the first place, the Commission's finding

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eight inches on the American side of the Canadian border and exposing a banned film eight inches on the Canadian side of the border. The court found the action violative of the customs statute, notwithstanding the fact that only rays of light actually crossed the border.

here rested upon much more than the mere fact of FPL's interconnection with an interstate network. But more fundamentally, the Court in *Jersey Central* did not have before it the evaluation of extensive evidence of the interdependence of interconnected systems that was the basis for the Commission's decision in this case. Although some evidence on the synchronization of interconnected utilities was before the Commission in that case, see 129 F. 2d 183, 187, n. 1, the Commission's order finding Jersey Central to be a "public utility," was based upon an express finding that electric energy flows could be traced from Jersey Central over the lines of an intervening utility to the State of New York. 2 F.P.C. 541, 542–543. In view of the limited number of interconnections involved in that case and the relative ease with which the energy flows could be traced, there was no occasion for the Commission or this Court, in affirming the Commission, to consider other bases for jurisdiction. Since *Jersey Central,* however, several jurisdictional cases have arisen involving situations where the tracing of power flows is not practicable. The decisions of the Commission and courts of appeals in those cases support the Commission's decision here.

In *Indiana & Michigan Electric Co.* v. *Federal Power Commission,* 365 F. 2d 180 (C.A. 7), certiorari denied, 385 U.S. 972, the Seventh Circuit was faced with the question whether particular sales at wholesale of I & M, an admitted "public utility," involved electric energy in interstate commerce and thus were

subject to Commission regulation.[17] In finding all of I & M's sales at wholesale subject to its jurisdiction, the Commission noted that it was impracticable to trace energy flows from specific generating plants to specific loads, but concluded that interstate energy nevertheless pervaded the company's entire system. 365 F. 2d at 182. In upholding the Commission's conclusion, the court of appeals relied on the fact that I & M was part of a coordinated power pool operating as an integrated system in several states. The court noted that the "electric load of every customer of every operating company in the System is supplied with electric energy from the entire * * * pool" and also discussed at length the dynamics of interconnected power systems and the tie line and frequency control equipment employed by the systems. 365 F. 2d at 182-183. Similar results, based upon analyses of the mode of operation of interconnected utilities forming a power pool where tracing was impractical, were reached by the Sixth and Eighth Circuits in *Cincinnati Gas & Electric Co.* v. *Federal Power Commission,* 376 F. 2d 506 (C.A. 6), certiorari denied, 389 U.S. 842, and *Arkansas Power & Light Co.* v. *Federal Power Commission,* 368 F. 2d 376 (C.A. 8).[18]

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[17] Section 201(b) of the Act grants the Commission jurisdiction over "the sale of electric energy at wholesale in interstate commerce." Thus to reach any particular wholesale sale, the Commission must establish as a fact that the sale involves energy "in interstate commerce."

[18] The Commission, in *Arkansas Power & Light*, had noted in a passage of considerable relevance here (34 F.P.C. 747, 751, quoted by the court of appeals, 368 F. 2d at 382):

> An interstate electric network is dynamic and ever changing both with respect to load and to generation source. It is

Another wholesale rate case, *Public Service Company of Indiana* v. *Federal Power Commission*, 375 F. 2d 100 (C.A. 7), certiorari denied, 387 U.S. 931, provides an even closer analogy to this case. In contrast to the pooling arrangements of which I & M, Arkansas and Cincinnati were a part, PSCI's relations with its neighbors were far more limited. 34 F.P.C. 1513, 1516–1517. The company was, however, interconnected with six other utilities and, like FPL here, was part of a multi-state, integrated electric power system.[19] In upholding the Commission's as-

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an oversimplification, therefore, to talk in terms of a flow of electricity from point to point in an integrated power network of the type involved here. Instead, generation from each source in the system contributes directly or indirectly, and to an ever varying extent, to the energy present, in all parts of the system which are not isolated from out-of-state energy sources. The fact that, as a matter of engineering determination, identification of either the source or destination of particular units of energy within an interstate power system such as respondent's may be difficult and at times impossible does not detract from the interstate nature of the over-all operation. On the contrary, the more complex and comprehensive the nature of the interstate network, the more unlikely it will be that any energy sources will be measurably identifiable. The use of tracing to disprove that a particular sale of a company which is part of an electrically integrated interstate system is in interstate commerce is a wholly unrealistic methodology which is irrelevant to present day power system technology.

[19] Referring to the "mere connection" language of this Court in *Jersey Central*, the Commission had noted that "[t]o characterize PSCI's relationships with its neighbors, including those in or receiving power from other states, as mere interconnection is simply to ignore the record." 34 F.P.C. 1513, 1517–1518. Much the same observation can be made with respect to FPL in this case.

sertion of jurisdiction over PSCI's sales at wholesale, the Seventh Circuit followed the rationale of the *I & M* and *Arkansas* cases and held that the Commission was not required to make specific tracings of power flows. 375 F. 2d 103–104.

The court below sought to distinguish the above cases on two grounds: (1) that the utilities there involved were all members of interstate power pools and (2) that establishing wholesale rate jurisdiction over an electric company already subject to Commission jurisdiction is a different matter from establishing jurisdiction over a company in the first instance (App. 369–371). Neither distinction, in our view, is significant.

While undoubtedly FPL's participation in the Florida Operating Committee and the ISG lacks the scope of the pooling arrangements of which I & M, Arkansas, Cincinnati and, to a lesser extent, PSCI were a part, the difference is only one of degree and is not material to the issue whether interstate energy is present in a system or a particular portion of a system. As we have shown (see pp. 11, 26, *supra*), FPL receives substantial benefits from its participation in the multistate network to which it is electromagnetically locked.

The second attempted distinction is based on the lower court's view that wholesale cases "have little application to the problems of federalism and reservations of power to the states imposed by the instant

case, where the issue is one of whether FPL is a public utility at all * * *" (App. 371). As our review of the legislative history of the 1935 amendments to the Federal Power Act indicates, however (see pp. 19–21, *supra*), problems of federalism were very much behind the limitation of Commission rate jurisdiction to sales at wholesale of electric energy in interstate commerce, since the assertion of federal jurisdiction necessarily preempts the jurisdiction of any state authority over such sales. See *Federal Power Commission* v. *Southern California Edison Co.*, 376 U.S. 205, 210–216. In *Southern California*, this Court referred to the debates in Congress in 1935 concerning the scope of federal wholesale jurisdiction under the proposed amendments and the ultimate decision, based largely on an interpretation of *Public Utilities Commission* v. *Attleboro Steam & Electric Co.*, 273 U.S. 83, to—

> * * * draw a bright line easily ascertained, between state and federal jurisdiction * * * making FPC jurisdiction plenary and extending it to all wholesale sales in interstate commerce except those which Congress has made explicitly subject to regulation by the States [376 U.S. at 215–216].

Congress employed the same "in interstate commerce" standard to govern Commission jurisdiction over electric utilities as it employed to govern jurisdiction over sales at wholesale; there is no indication in the legislative history that this "bright line" was not to be the same in both situations.

III. SUBSTANTIAL EVIDENCE ALSO SUPPORTS THE COMMISSION'S DETERMINATION, AS AN ALTERNATE BASIS FOR JURISDICTION, THAT THE STAFF TRACING STUDIES ESTABLISHED THAT ELECTRIC ENERGY HAD ON OCCASION FLOWED FROM GEORGIA TO FPL AND FROM FPL TO GEORGIA.

Since the passage of the 1935 Federal Power Act amendments, the Commission has in several cases sought to establish its jurisdiction—either over an electric utility as a "public utility" or over a particular sale at wholesale—by tracing power flows through the readings of commercial meters to show the presence of interstate electric energy on a given system or on part of a given system. In some cases, such as *Jersey Central Power & Light Co.* v. *Federal Power Commission,* 319 U.S. 61 (discussed at pp. 21, 26–27, *supra*), the task of tracing has been simple due to the limited number of interconnections involved. In other cases, such as those discussed at pp. 27–30, *supra,* the systems have been of such complexity that no tracing—or very limited tracing at best—has been practicable.[20] Finally, there has been a middle category of cases where tracing is possible, but is so involved that the methods used have required refinement to take into account the fact that energy generated outside of a

[20] In *Public Service Company of Indiana, Inc., supra,* p. 29, where a very limited tracing study had been introduced by the staff, a staff witness testified before the Commission that tracing was neither feasible or practicable for studying the PSCI system. Any such study, he estimated, would take from one to two years assuming no changes in the structure of the system. If changes occurred, however, restudy would be necessary making it almost impossible to complete the study. 375 F. 2d at 104, n. 7.

state frequently becomes commingled on a system's transmission lines with energy generated within the state. The Commission's treatment of such commingled energy as interstate energy has been approved by this Court. See *Pennsylvania Water & Power Co.* v. *Federal Power Commission*, 343 U.S. 414, 419–420; see also *Wisconsin-Michigan Power Co.* v. *Federal Power Commission*, 197 F. 2d 472 (C.A. 7).

The present case falls within the middle category: Refined tracing techniques can be and were used to show that electric energy flowed from Georgia over the transmission lines of Corp to FPL and from FPL over the same transmission lines to Georgia. While we submit that in this modern age of vastly complex electrical networks, the tracing of power flows is an unnecessary and inefficient procedure for determining Commission jurisdiction,[21] the fact remains that tracing was used in this proceeding and provides a firm, alternate basis for the Commission's assertion of jurisdiction over FPL.

The court of appeals rejected the staff's utilization of the commingled method of tracing power flows, ruling that the "engineering and scientific fact test

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[21] As long as tracing plays a significant role in jurisdictional proceedings before the Commission, electric utilities seeking to avoid jurisdiction will be encouraged to arrange their interconnections with other utilities, not to maximize the coordination and efficiency of the interconnected systems, but to make the tracing of interstate power flows as difficult as possible. Such a result would, of course, be undesirable and would result in a triumph of form over substance. Cf. *Pantomimic Corp.* v. *Malone*, *supra*, n. 16.

for interstate flow of energy is not met by postulating a simplified characterization of how, for various purposes of convenience, energy may be treated as flowing" (App. 367–368). What the court overlooked, however, is that any tracing method is necessarily based on a simplified model of an electric system as all tracing methods employ readings from commercial meters. As we have noted (see pp. 12–13, *supra*), most commercial meters record only net electrical data and do not reflect the actual physics of a three phase alternating current system. Thus, the developing of a method for tracing power flows necessarily depends upon expert judgment to assure that the approximate and simplified model of an electric system employed by the method reflects as closely as possible the physical dynamics of modern power transmission.

The court of appeals correctly noted that the flow of electric energy is a "complex and not yet fully explainable" phenomenon (App. 365). The staff, presented, however, extensive evidence on what is known about three-phase power systems and compared different tracing methods to determine which method best took into account the known attributes of such power (see pp. 12–14, *supra*). In short, the staff concluded that the commingled tracing method's treatment of a bus as a point or reservoir adequately reflected the fact that three-phase power consists of both positive and negative power pulses moving in both

directions—a phenomenon not recorded by commercial meters.[22]

The hearing examiner heard all of the conflicting testimony on tracing methods and the dynamics of three phase power, frequently interrupting the lawyers and the witnesses to interject his own questions. Accordingly, he was in the best position to weigh the evidence and his determination that the commingled method and its assumptions adequately reflect the physical reality of three-phase alternating current is entitled to great weight. On the basis of the evidentiary record and the hearing examiner's analysis, the Commission was fully justified in accepting the results of the staff's tracing studies as a basis for jurisdiction over FPL.

The court of appeals' reversal of the Commission in this case rested upon its judgment that the Com-

[22] Dr. Jessel testified (App. 47) that the commingled tracing method had been used in two earlier formal proceedings before the Commission: *Pennsylvania Water & Power Co.*, 8 F.P.C. 1, affirmed *sub nom. Pennsylvania Water & Power Co.* v. *Federal Power Commission*, 193 F. 2d 230 (C.A. D.C.), affirmed, 343 U.S. 414, and *Wisconsin-Michigan Power Co.*, 10 F.P.C. 170, affirmed *sub nom. Wisconsin-Michigan Power Co.* v. *Federal Power Commission*, 197 F. 2d 472 (C.A. 7). While neither of the Commission's decisions in those cases discusses the commingled method's treatment of a bus, a later Commission decision refers to the treatment of a bus as a point in the *Pennsylvania Water & Power Co.* tracing studies. See *City of Colton* v. *Southern California Edison Co.*, 26 F.P.C. 223, 231, reversed *sub nom. Southern California Edison Co.* v. *Federal Power Commission*, 310 F. 2d 784 (C.A. 9), reversed, 376 U.S. 205.

mission had not demonstrated with sufficient scientific certainty that there are "actual" transmissions of interstate energy on FPL's facilities. The court did not find that the Commission had committed any error of law; nor did it find that the evidence required acceptance of the "systems study" tracing method advocated by FPL. Rather, the court held simply that the Commission cannot exercise jurisdiction over a major utility such as FPL unless and until it can convince a court of scientific laymen that, in commonsense terms, some identifiable thing moves across state lines. This is, we submit, an unsatisfactory approach to the "engineering and scientific" test of jurisdiction, see *Connecticut Light & Power Co.* v. *Federal Power Commission, supra,* p. 20. The statutory scheme evidently contemplates that the Commission either has or does not have jurisdiction over FPL, and it is not enough to say that the Commission must abstain until such time—if ever—as it can be proven as a "fact" in common law terms that there is an "actual" transmission. As in other regulatory areas, decision cannot be avoided on the ground that no decision can have absolute certainty; it is the very impossibility of such certainty that led Congress to commit the matter to the expert judgment of an administrative agency.

We recognize that the Commission had the burden of establishing the jurisdictional premise, but we submit that it did so when it determined, on the basis of careful consideration of the best expert opinion, that, in scientific terms, there are interstate transmissions on FPL's facilities. If, as is well established, the test of jurisdiction is to be truly a scientific test,

the expert administrative body must be allowed to use a scientific definition of what a "transmission" is. This is not like the traditional judicial situation where, for example, psychiatric experts are called to assist a lay finder of fact in determining whether a defendant is, in layman's terms, sufficiently sane to be responsible for his actions. The court below has, we think, improperly tried to fit the issue in this case into that traditional mold, and in so doing has lost sight of the unique nature of the administrative process, which places such determinations in the hands of an expert body, with only limited judicial review to consider whether substantial evidence supports that body's determination. Cf. *Sunshine Anthracite Coal Co.* v. *Adkins,* 310 U.S. 381, 399–401; *Gray* v. *Powell,* 314 U.S. 402, 411–414; *Griggs* v. *Duke Power Co.,* No. 124, 1970 Term, decided March 8, 1971, slip op. pp. 8–9. Here, as we have shown, the Commission's expert conclusion is amply supported by substantial evidence; in holding otherwise, the court of appeals has improperly acted on the basis of its own inexpert views.

As we have suggested, the economic realities of FPL's relationship with the network of its interconnected utilities militate strongly in favor of federal regulation. A major purpose of the 1935 amendments that produced Section 201 was to provide federal coordination of the nation's electrical systems, and that purpose will evidently be facilitated by jurisdiction over FPL, the nation's ninth largest system in terms of sales. We are not, of course, suggesting that an economic test be substituted for the established scientific test of federal

jurisdiction. We do urge, however, that the need for federal regulation in these critical days for the nation's electric power resources should not be defeated when, as here, the scientific premises for federal jurisdiction have been properly established.

CONCLUSION

For the foregoing reasons, the judgment of the court of appeals should be reversed.

Respectfully submitted.

ERWIN N. GRISWOLD,
Solicitor General.

SAMUEL HUNTINGTON,
Assistant to the Solicitor General.

GORDON GOOCH,
General Counsel,

DREXEL D. JOURNEY,
Deputy General Counsel,

DAVID F. STOVER,
Attorney,
Federal Power Commission.

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1970

No. ~~958~~ 70-38

FEDERAL POWER COMMISSION, *Petitioner*

v.

FLORIDA POWER & LIGHT COMPANY, *Respondent*

On Writ of Certiorari to the United States Court of Appeals for the Fifth Circuit

MOTION OF AMERICAN PUBLIC POWER ASSOCIATION FOR LEAVE TO FILE BRIEF AMICUS CURIAE ON THE MERITS, AND BRIEF

NORTHCUTT ELY
1200 Tower Building
Washington, D. C. 20005
General Counsel for the American Public Power Association

PRESS OF BYRON S. ADAMS PRINTING, INC., WASHINGTON, D. C.

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1970

No. 958

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On Writ of Certiorari to the United States Court of Appeals for the Fifth Circuit

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MOTION OF AMERICAN PUBLIC POWER ASSOCIATION FOR LEAVE TO FILE BRIEF AMICUS CURIAE, ON THE MERITS

The American Public Power Association respectfully moves this Court for leave to file the accompanying brief on the merits in this case as amicus curiae in support of the Solicitor General on behalf of the Federal Power Commission. The attorneys for the petitioner have consented to the filing of this brief but the attorneys for the respondent, Florida Power & Light Company (FPL), have refused consent.

The applicant was granted leave to file a brief as amicus curiae in support of the Solicitor General's petition for certiorari, and did so. The present application is submitted on the same grounds.

The applicant, American Public Power Association (APPA), a national service organization, has an interest in this case in that it represents more than 1,400 local, publicly owned electric utilities in 49 states, Puerto Rico, the Virgin Islands and Guam. Many of these publicly owned utilities are directly and seriously affected by the decision in the court below.

The basic issue presented in the case is whether the interconnection of an electric power utility with an interstate transmission grid involved "transmission of electric energy in interstate commerce," thus subjecting the utility to the Commission's regulatory jurisdiction pursuant to Section 201 of the Federal Power Act, 16 U.S.C. § 824.

In finding that FPL's interconnection with an interstate transmission grid involved the interconnecting utility in interstate commerce, the Commission relied upon the "electromagnetic unity of response" theory and the "commingled tracing" theory. The court below overturned the Commission's determination, rejecting the Commission's exercise of its expertise, and held FPL to be free of the Commission's jurisdiction. In short, FPL's election to participate in an interstate power pool, to obtain the benefit of reserve generating capacity in power systems in other states, in consideration of its dedicating reserve capacity on its own system for use in those other states, was held to have no consequence with respect to interstate commerce, that is, interstate transmission of energy.

Florida Power & Light Company v. *Federal Power Commission*, 430 F.2d 1377 (5th Cir. 1970).

The decision below leaves the Commission with no adequate basis for ascertaining the scope of its own jurisdiction as the lower court rejected the Commission's "engineering and scientific" tests for determining jurisdiction over utilities. Such uncertainty would severely jeopardize the Commission's ability to regulate sales at wholesale of interest power and to order, under appropriate circumstances, interconnections between utilities.

The Commission's power to compel necessary interconnections under Section 202(b) of the Act (16 U.S.C. § 824a(b), and its jurisdiction under Sections 205 (16 U.S.C. § 824d) and 206 (16 U.S.C. § 824e) over sales at wholesale by private companies to the public power systems with which they are interconnected, are absolutely vital for the survival of many of the dispersed, publicly owned utility systems which meet an important portion of the Nation's electric needs. Most of these systems are members of the American Public Power Association.

The American Public Power Association respectfully requests this Court to grant permission to file the annexed brief amicus curiae.

Respectfully submitted,

NORTHCUTT ELY
1200 Tower Building
Washington, D. C. 20005
General Counsel for the American Public Power Association

IN THE

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BRIEF OF THE AMERICAN PUBLIC POWER ASSOCIATION, AS AMICUS CURIAE, ON THE MERITS

INTEREST OF THIS AMICUS CURIAE

American Public Power Association (A.P.P.A.) is a national service organization consisting of, and serving, local consumer-owned electric utilities—that is, utilities owned by political subdivisions of states, such as municipalities, districts, and cooperatives. In 1970 there were 2,942 consumer-owned utilities in the United States, and A.P.P.A. represented about half of them, some 1,400, in 49 states. Consumer-owned utilities in 1971 accounted for about 12.4 percent of the country's installed generating capacity, and served about 22.1

percent of the Nation's power customers, consuming about 18.8 percent of the electric energy sold to ultimate customers.[1]

An important fact which characterizes the consumer-owned utilities is that most of them are dependent upon interconnections with privately owned utilities for their power supply, lacking generating capacity of their own to satisfy the needs of their consumers.

The Federal Power Commission has reported,[2] for the latest year (1968) for which its statistics are available, that private utilities furnished the total requirements of 683 municipalities and 318 cooperatives, and furnished partial requirements of 203 municipalities and 202 cooperatives.

This dependence of consumer-owned utilities on interconnection with the much larger privately owned utilities which surround them is the reason for the life-and-death importance of this case to many of these systems and the consumers dependent upon them.

The Commission's jurisdiction in the present case[3] is dependent upon a determination that the Company is a "public utility" under Section 201(e) of the Federal Power Act (16 U.S.C. § 824(e)). If so, a whole train of jurisdictional powers attaches including two that are essential to the survival of small public systems dependent upon power from outside sources: the Commission's power to compel interconnections under

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[1] Public Power, Jan.-Feb. 1971 at 18.

[2] FPC, Sales of Firm Electric Power for Resale, 1965-1968, by private electric utilities, Table A at 2-3 (1970).

[3] The issue in the present case is the Commission's power to require the Company to keep its accounts in accordance with the Commission's uniform system of accounting (Sec. 301(a), 16 U.S.C. § 825(a)).

Section 202(b) (16 U.S.C. § 824a(b)), and its power to effectuate reasonable and non-discriminatory rates under Sections 205 (16 U.S.C. § 824d) and 206 (16 U.S.C. § 824e).[4]

[4] There are, of course, many other salutary elements of Commission jurisdiction, if the Company in question is found to be a public utility. These include statutory prohibitions of issuance of securities without Commission approval and of capitalization of any franchise or contract in excess of the amount actually paid for it (Sec. 204, 16 U.S.C. § 824c), power to determine the adequacy of interstate service (Sec. 207, 16 U.S.C. § 824f), to investigate and ascertain the actual legitimate cost of the property, and depreciation thereon (Sec. 208, 16 U.S.C. § 824g). Beyond this, the applicability of many provisions of Part III of the Act to a power company hinges on whether it is a public utility within the meaning of Sec. 201(e), 16 U.S.C. § 824(e) (or a licensee under Part I of the Act). These provisions relate to access of the Commission to the utility's books (Sec. 301(b), 16 U.S.C. § 825(b)); authority to the Commission to fix depreciation rates (Sec. 302, 16 U.S.C. § 825a); requirements that utilities file annual reports with the Commission (Sec. 304, 16 U.S.C. § 825c); prohibition against utility officers and directors dealing in securities of their companies (Sec. 305(a), 16 U.S.C. § 824d(a)); prohibition of interlocking directorates as between utilities and banks, security underwriters, etc. (Sec. 305(b), 16 U.S.C. § 824d(b)); authority to the Commission to hear and investigate complaints of violation of the Act (Sec. 306, 16 U.S.C. § 825e); authority to the Commission to make investigations, compel the production of books, and require the attendance of witnesses (Sec. 307, 16 U.S.C. § 825f); to hold hearings (Sec. 308, 16 U.S.C. § 825g); to prescribe orders, rules and regulations (Sec. 309, 16 U.S.C. § 825h). The applicability of other sections of the Act is indirectly but importantly affected by the Company's status as a public utility, *e.g.*, authority to the Commission to bring suit in federal courts to enforce the Act or enjoin its violation (Sec. 314, 16 U.S.C. § 825m); provisions for forfeitures and penalties for violation of the Commission's orders (Secs. 315, 316, 16 U.S.C. §§ 825n, 825o); provisions establishing jurisdiction of federal courts of suits to enforce the Act (Sec. 317, 16 U.S.C. § 825p); provisions for resolution of conflicts of jurisdiction between the Federal Power Commission and the Securities and Exchange Commission (Sec. 318, 16 U.S.C. § 825q).

QUESTION PRESENTED

We agree with the Solicitor General's statement of the question presented, in his Petition for Certiorari. This reads:

> "Whether the Federal Power Commission properly determined that the interconnection of an electric power utility with an interstate transmission grid involved 'transmission of electric energy in interstate commerce' and thus made the utility subject to the Commission's regulatory jurisdiction."

We support each of the Solicitor General's arguments that this question should be answered in the affirmative.

This amicus is primarily affected by the Commission's determination that the interconnection of transmission systems in an interstate grid, interlocking all interconnected generators in all states electromagnetically, inevitably occasions interstate transmission of energy throughout such a grid because of the electromagnetic unity of response of all of the interconnected generators in all states to the whole interconnected load in all states, without the necessity for (indeed, without the possibility of) tracing the flow of energy from a particular generator to a particular customer, and by the error of the court below in rejecting that engineering determination as a basis for the Commission's jurisdiction. Our argument will be directed to that issue. We support, but do not argue, the alternative ground that energy from out of state was actually traced to Florida Power & Light Co.'s system, and traced also from that system to points outside the state.

It should be noted that the issue here is whether the Company is a public utility within the meaning of Section 201(e),[5] not the narrower question of whether a particular sale by this utility is a sale in interstate commerce within the meaning of Section 205.[6] By virtue of cross-reference of Section 201(e) to Section 201(b), 16 U.S.C. § 824(b), a company which owns or operates *either* facilities for (1) transmission of electric energy in interstate commerce, *or* (2) sale of electric energy in interstate commerce, is a public utility. This case concerns the first alternative.

STATEMENT OF THE CASE

We think it important that the Court have before it the exceptionally lucid explanation of the Presiding Examiner of just how an interstate transmission grid, such as that with which Florida Power & Light Co. is interconnected, functions. We reprint extracts from his decision below, and adopt them as our statement of facts. The Examiner said (App. 255):

> "Florida Power & Light Company (Florida) engages in the generation, transmission, and distribution at wholesale and retail of electric energy throughout major portions of Florida. The essential issue in this case is whether Florida is a public utility—whether the Commission has jurisdiction over it under Section 201 of the Federal Power Act. This depends on whether Florida operates facilities for the transmission of electric energy in interstate commerce.

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[5] *Cf.* Jersey Central Power & Light Co. v. FPC, 319 U.S. 61 (1943).

[6] *Cf.* FPC v. Southern California Edison Co., 376 U.S. 205 (1964).

"If the Commission has jurisdiction over Florida, Florida is required to maintain its accounts according to the Commission's Uniform System of Accounts; therefore, whether Florida should so maintain its accounts is in issue in this proceeding. But there is not in issue in this proceeding any rate matter. However, if Florida is found to be a public utility, the Commission would have jurisdiction in other proceedings with respect to the rates of such of its sales for resale which are in interstate commerce, and also with respect to compelling its physical interconnection with other systems. But decisions on these matters are not in issue in this proceeding.

* * * *

(App. 255-56):

"The first and indeed the major question in this proceeding is: Does Florida transmit interstate electric energy? There are many significant factors which bear on this issue, but these two are major:

"(1) Florida is interconnected with Florida Power Corporation (Corp), another Florida electric utility company. Substantial amounts of electric power are interchanged between Florida and Corp.

"(2) Corp is interconnected with Georgia Power Company (Georgia), which operates in Georgia. Substantial amounts of power are interchanged between Corp and Georgia.

"So the question becomes: Is electric energy transmitted between Georgia and Florida via Corp?

* * * *

(App. 257):

"Florida has relationships and is interconnected with four other Florida electric systems, Corp,

Tampa Electric Company (Tampa), Orlando Utilities Commission (Orlando), and the City of Jacksonville (Jacksonville).

"Florida, Corp and Tampa form the Florida Operating Committee with Jacksonville and Orlando as associate members.

* * * *

(App. 260):

"Corp is interconnected with Florida as well as two other members of the Florida Operating Committee, Tampa and Orlando. Corp is also interconnected with Georgia. Thus Corp is interconnected with Florida on the south and with Georgia on the north.

"Georgia is a subsidiary of The Southern Company (Southern), a holding company whose other subsidiaries are Gulf Power Company (Gulf) which operates in northwestern Florida, Alabama Power Company (Alabama), and Mississippi Power Company. Corp is interconnected with Gulf, and Gulf is interconnected with Georgia and Alabama. Pursuant to an agreement between the subsidiaries of Southern, on the one hand, and Corp, on the other, during the summer Corp makes available 100,000 kw to the Southern subsidiaries and during the winter the Southern subsidiaries make available to Corp 100,000 kw.

* * * *

(App. 260-61):

"Georgia is also interconnected with Duke Power Company, Tennessee Valley Authority, Southeastern Power Administration and others. These systems operate in states beyond Georgia.

* * * *

(App. 261):

"Florida and the other members of the Florida Operating Committee are members of a multi-state electric network, the Southeast Region of the Interconnected Systems Group (ISG)[7] which covers the southeastern and central portions of the country. Florida operates in synchronism with the 140 members of ISG and is ready to assist them or to receive assistance from them in case of emergency. Thus during a 580 mw generator loss by a midwestern utility Florida contributed 8 mw to ISG.

"Electric energy transmitted between Corp and Georgia passes through Fort White, a point at the northern part of Corp's system. If power flow exceeds 100 mw at this point the ties open, cutting off the power. Hence assistance between Florida and ISG via the Corp-Georgia interconnection cannot be relied on where the need exceeds 100 mw. However 12 of Florida's 24 generating units generate 75 mw or less. An outage of any of these units would lead to almost instant ISG assistance to Florida. However, no such limitation appears applicable to assistance from ISG via the Florida-Corp-Gulf-Georgia interconnections.

* * * *

(App. 262-63):

"Electric power on Florida, Corp, and Georgia and all other interconnected systems is supplied as

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[7] Our note: The Interconnected Systems Group has been described in Arkansas Power & Light Co. v. FPC, 368 F.2d 376, 378 (8th Cir. 1966); Public Service Co. of Indiana v. FPC, 375 F.2d 100, 102 (7th Cir.), *cert. denied*, 387 U.S. 931 (1967), and Cincinnati Gas & Elec. Co. v. FPC, 376 F.2d 506, 508 (6th Cir.), *cert. denied*, 389 U.S. 842 (1967). The latter described it as "consisting of one hundred forty utility systems, in thirty-two states. The System forms a pool of multi-state energy which supplied the load of CG&E in synchronism with the other connected utilities." 376 F.2d at 508.

alternating current at a frequency of 60 cycles. Interconnected synchronous operation, or 'parallel operation,' as the term is used in the industry, requires that the frequency of each system be in synchronism with that of all others in the interconnection. Two or more electric systems cannot (except under special and rare conditions) operate together unless they are in synchronism. This means that the current pulses on these systems, and thus the frequency, coincide exactly; not approximately, but exactly. Birmingham is served by Alabama which is interconnected with Georgia which is interconnected with Corp. Miami is served by Florida which is interconnected with Corp. The frequency of the pulses is exactly the same in Miami and Birmingham, and if it changes to a new value in Birmingham, then it changes to exactly that same value in Miami. The speed of every electric generator on every electric system in an interconnected group is irrevocably locked to the same frequency. A variation in one affects all.

"The line bias with frequency control[8] is the technique used to maintain frequency at 60 cycles on interconnected electric systems operating in synchronism, such as Florida, Corp and Georgia, and is also used to match generation with net system load. Bias is the automatic shift of a system's interchange schedule with frequency. The basic function of modern frequency and tie line control is that of regulating total generating output in each individual system or control area in such a way that the total generation will match continuously and as closely as possible the total system load, including scheduled load on interconnection ties.

"Frequency never remains at 60 cycles—it is always a bit above or a bit below; because the loads

[8] Our note: "Tie line bias," and "frequency control" are also explained in Arkansas Power & Light Co. v. FPC, 368 F.2d 376, 378 (8th Cir. 1966).

are always fluctuating and the generation follows to keep the system load and generation in balance and as close to 60 cycles as possible. Although deviations in frequency almost always occur due to the impossibility of matching instantaneous load variations with rapid changes in generation, it is important for system operation to keep these frequency deviations as small as possible.

* * * *

(App. 263-68):

"Each generating unit when operating at a speed corresponding to 60 cycles has mechanical energy of rotation stored in its rotating components which is automatically convertible to electric energy when there is a decrease in frequency and a corresponding drop in revolutions per minute. When a load is added suddenly to an electric system or a generator is taken suddenly out of service, assuming no other changes occur, every generating unit operating on the Florida system and all connected systems almost instantly experience a loss in speed, so that the mechanical energy of rotation of every generator is converted to electric energy. The sum total of the electric energy so obtained through the conversion of mechanical energy of rotation supplies part of the new load or takes the place of some of the lost generation. Thus every connected generator on the entire interconnected system contributes energy to the interconnected system to supply part of the additional load and so maintain the balance between total system generation and total system load. Following this initial reaction, the governor on each generator reacts in accordance with its sensitivity, rate of response, and position in relation to its 'dead band' (the area within which a governor will not respond to a change in load), causing additional steam to be applied to the turbines and to speed up the generators thus producing more energy, which in turn

increases the speed of all generators, bringing frequency back to normal. As these events occur, the tie line bias of all the systems is operating so that the net interchange of each system with its neighbors will tend to return to the former prearranged level. Because of the tie line bias of each system, the particular system on which the increase actually occurred will eventually increase generation to supply the additional load and the other systems will correspondingly reduce their temporarily increased electric generation.

"Changes in load at various points on all systems are constantly occurring, producing changes in frequency throughout all interconnected systems. The resulting changes in generation of electric energy throughout the interconnected systems reduce the range of the changes in frequency and thus improve the efficiency of operation of the interconnected systems. Thus unnecessary speed-up or slow-down in generating equipment is minimized; clocks keep more perfect time; precision industrial operations are improved; and oscillations between generators are reduced. This is accomplished by the dispersal of the immediate effects of load changes throughout the electromagnetically interlocked generators of the interconnected systems. One of the reasons for the interconnection of systems is the ability of such systems to promote stability in generation and frequency by dispersing the effects of load changes throughout larger systems. These effects result in a constant swapping and redistribution of loads borne by the various generators throughout interconnected systems.

"These changes are worked through quickly. But they occur. And they occur continuously and frequently.

"Thus the modern electric system, such as that of Florida and the systems with which it is inter-

connected, is an ever varying one; loads and generation are constantly varying from moment to moment as lights are switched on and off and as workmen increase or decrease the power in the machines they use in myriad operations.

"For any particular loading on an electric system or interconnected set of systems all of the electric energy produced by all the generating units is delivered to the common coordinated and integrated modern transmission system from which all of the customers are supplied. Variations in load at any point cause changes throughout the interconnected electric systems because of the interdependence of the generating sources. All generating units connected to a common network experience the same changes in frequency and all clocks connected to such a network experience these changes in frequency and maintain the same time.

"No attempt is made to control flows in individual lines because the electric energy flows are determined by the electric characteristics of the network. Only the net of flows over all interconnections on a system is controlled by increasing or decreasing generation so as to maintain interconnection schedules and to maintain frequency as closely as possible at 60 cycles. The changes in generation are in response to changes in load and the effects of tie line bias on all the interconnected systems.

"The electrical and other characteristics of an electrical network affect the transfers of electric power and energy at points of connection with other interconnected electric systems. The moment to moment distribution of electric power and energy in an electric network is determined automatically by (1) the electric characteristics, namely, resistance, inductive reactance and capacitative reactance of the electric lines and electric

facilities; (2) the locations and power outputs of generating units in operation; and (3) the locations of and amounts of power taken by the electric loads. The electric loads on an electric system vary from moment to moment and so does the total generation. Consequently, the transfers of electric power at points of connection of Florida with other interconnected electric systems vary from moment to moment.

"Electric systems, such as Florida, Corp, Georgia, and others normally have no control over the actual transfers of electric power and energy over any particular transmission interconnection with another electric system if there is more than one interconnection. Similarly electric utilities, such as Florida, Corp, Georgia, and others, normally have no control over the actual transfers of electric power and energy with any particular electric system if there are interconnections with two or more electric systems, which are also directly or indirectly connected. In each instance this is due to the free flow characteristics of the electric networks. All that is normally controlled by each system is the net of flows over all its interconnections which is brought about through the effects of tie line bias, frequency changes, governor reactions and generator responses thereto.

"Thus there is a free flow of power and energy throughout the electric network in which Corp and Georgia participate. There is also a free flow of power and energy throughout the electric network formed by Corp and Florida. And there is a free flow of energy among Georgia, Corp, and Florida.

"All 140 members of the ISG operate in parallel. All are interlocked electromagnetically and maintain the same frequency. Each member renders automatic assistance to the other in times of emergency. As previously noted, Florida can receive from or contribute to ISG up to 100 mw. The net-

work formed by all the members of ISG and the tie line bias and frequency control used by member systems provide mutual assistance in maintaining standard 60-cycle frequency, thereby improving the efficiency of operation of all.

"Electric systems operating together on an interconnected basis, such as Florida, Corp and Georgia, schedule the amounts of power and energy transactions among themselves on an hour-to-hour basis and each sets on its own net interchange controller the net amount of scheduled transactions. Each system measures the actual transfers at each point of connection with another electric system and the differences between scheduled transactions and actual transfers are balanced out as soon as practical. In order that the technique may work efficiently all interconnected systems must do their share in adhering to schedules as closely as possible.

"In actuality there are substantial differences between the scheduled and actual transactions. The reason is that none of the connected electric systems including that of Florida, Corp, and Georgia has any control over the actual transfers of power at each point of interconnection because of the free flow characteristics of electric networks. All that can be controlled on each system having more than one interconnection with other electric systems is the net of transfers into or out of its own system or area. This is particularly so with respect to the electric system of Florida because some of the electric systems to which it is connected have connections among themselves.

* * * *

(App. 268-70):

"The electric systems of Florida and all other interconnected systems are essentially alike as to electrical, electromagnetic and electromechanical

characteristics. Because they are alike, it is possible to have presently existing interconnected operations on a very large scale, extending from the Rocky Mountains to the Atlantic Ocean and from the Canadian to the Mexican border.

"For all practical purposes electric energy in the form of alternating current is generated as needed because it cannot be stored in electrical form. At any point in time such electric energy is delivered where needed on a system at a speed of about 186,000 miles per second. An interconnected electric system such as that of Florida, Corp, Georgia, and the others to which it is interconnected, automatically requires at constant frequency that at every moment total generation always be equal to total load plus losses; otherwise, there is an unbalance causing a change in frequency. An electric system cannot supply one connected load and not supply another connected load. For any particular loading on an electric system, all of the electric energy produced by all of the generating units is delivered to the common transmission network which acts as a single unit from which all of the customers are supplied. For any change in load or generation, there is an electrical effect through a change in voltage and current at all generators and at all loads.

"If a housewife in Atlanta on the Georgia system turns on a light, every generator on Florida's system almost instantly is caused to produce some quantity of additional electric energy which serves to maintain the balance in the interconnected system between generation and load. If sensitive enough instruments were available and were to be placed throughout Florida's system the increase in generation by every generator on Florida could be precisely measured.

"Nobody can say for certain just how electricity is really transmitted. The analogy to a flow of

water is metaphorical only. Does an electron move from one end of a thousand mile wire to another? Or is there only interaction between neighboring electrons or between fields of force? The answer is not important for legal purposes. The significant factors are that Florida's generators are interlocked electromagnetically with Georgia's and that in consequence, Florida's generators increase their production of electric energy almost instantaneously and automatically in response to increases in load on Georgia's system thereby contributing in some measure to the system supply which meets the increased Georgia load, reducing the variation in frequency on the Georgia system, and increasing its efficiency of operation. Without the Florida response the electric reactions on Georgia and the interconnected systems would be different.

* * * *

(App. 281):

"Another aspect of the interconnection problem concerns Florida's participation in ISG and its interconnection with 140 electric utility systems throughout the southern and central United States. All these systems operate in parallel and are interlocked electromagnetically. All are interdependent to some extent. The Northeast Power Failure of 1965 suggests the reach of such interdependence. It is expedient that FPC's exercise of jurisdiction which it is otherwise found to possess under the Act be in consonance with the reach and realities of modern interconnected electric systems."

The Commission found (App. 288-89):

"The testimony and evidence of record support the Examiner's findings that the electric power on all the interconnected systems in which FPL, Corp, and Georgia participate is supplied as alternating current at a frequency of 60 cycles; that the fre-

quency of each system is in synchronism with that of all the others in the interconnection; that there is a tie-line bias with frequency control on the interconnected system which permits a free flow of power and energy throughout the networks in which FPL, Corp, and Georgia participate; that all 140 members of the ISG operate in parallel and are interlocked electromagnetically; and that FPL can receive from or contribute to ISG up to 100 mw. The record further supports the Examiner's findings that FPL normally has no control over the actual transfers of electric power and energy with any particular electric system with which it is interconnected; that since electric energy can be delivered virtually instaneously when needed on a system at a speed of 186,000 miles per second, such energy can be and is transmitted to FPL when needed from out-of-state generators, and in turn can be and is transmitted from FPL to help meet out-of-state demands; and finally, that there is a cause and effect relationship in electric energy occurring throughout every generator and point on the FPL, Corp, Georgia, and Southern systems which constitutes interstate transmission of electric energy by, to, and from FPL.

"In its exceptions FPL argues that there is no substantial record support for the Examiner's finding that it is engaged in the transmission of electric energy in interstate commerce. We find no merit in this argument. The Examiner concluded that the operation of FPL in electromagnetic unity with the suppliers in and outside of Florida in and of itself demonstrated that it owned and operated facilities for the interstate transmission of electric energy. This finding is also supported by the evidence produced by staff at the hearing which convincingly establishes that electric energy is transmitted in interstate commerce to and from FPL's lines. The nature of staff's showing is fully consistent with, and satisfies the tests which we have established in numerous opinions issued in the last

> two years to support a finding that wholesale sales are in interstate commerce."

These findings of fact should be dispositive of the case. Section 313(b), 16 U.S.C. § 825*l*, directs: "The findings of the Commission as to the facts, if supported by substantial evidence, shall be conclusive."

The court below declined to give effect to these findings, saying (App. 364):

> "We conclude that the complex relationship of cause and effect in interconnected and synchronized systems is, as to FPL, not sufficient to prove the actual transmission of energy interstate. It tells us what, as to that company, could occur. It does not tell us with any substantial degree of certainty what does occur."

But the court seems to have given equally short shrift to the Company's theory, which it called the "steady state method."

The court said (App. 367): "Both suffer from the same vice of creating a construct which departs from the actual manner in which electricity operates and then attempting to trace the consequences."

But the court never tells us what its own "construct" is. It leaves the Commission and the industry without any understandable criterion of what proof is needed to establish that transmission facilities are used for transmission of electric energy in interstate commerce.

SUMMARY OF ARGUMENT

The Presiding Examiner and the Commission, in the exercise of their expert judgment, accurately determined that the generation and transmission facilities of Florida Power & Light Co. are interlocked electro-

magnetically with those of some 140 power systems, operating synchronously in parallel with them, so that the change in loads in any of these systems affects the operation of the generators in all systems, and thus energy flows automatically across state lines. In effect, all of the generators in all states so interconnected become a single machine. All facilities which effectuate this instantaneous, automatic "electromagnetic unity of response" on all generators in all states so interconnected are facilities for the transmission of electric energy in interstate commerce, within the meaning of Section 201(b) of the Federal Power Act. Consequently, any company which owns or operates any segment of the transmission facilities which unitize all generating capacity in all states is thus a "public utility" within the meaning of Section 201(e), of the Act, even though the segment of such transmission facilities owned by a particular company is located within a single state.

The functioning of each of the facilities so integrated interstate is outside the scope of the regulatory power of any single state.

The decision below, which rejected the engineering hypothesis of both the Commission and the Company, would recreate the "Attleboro Gap," by (1) denying jurisdiction to the Federal Power Commission with respect to facilities which are beyond the power of any state to regulate, and (2) conditioning the Commission's jurisdiction on tracing energy from a specific generator, which feeds into an interstate transmission grid, to a specific customer. The task is engineeringly impossible and legally unnecessary.

ARGUMENT

I. THE JURISDICTIONAL TEST OF SECTION 201(b) OF THE ACT IS MET BY PROOF THAT TRANSMISSION FACILITIES IN TWO OR MORE STATES ARE INTERCONNECTED, AND OPERATING IN SYNCHRONISM, HENCE SUBJECT TO ELECTROMAGNETIC UNITY OF RESPONSE OF THE GENERATORS IN ONE STATE TO THE LOAD ON THE INTERCONNECTED SYSTEM IN ANOTHER STATE.

A. Interstate transmission of electric energy automatically and inevitably takes place between such systems.

As the Presiding Examiner put it in his decision (App. 270):

> "The cause and effect relationship in electric energy occurring throughout every generator and point on the Georgia, Corp and Florida systems constitutes interstate transmission of electric energy by, to, and from Florida. It is the electromagnetic unity of response of Florida, Corp, Georgia and other interconnecting systems that constitutes the interstate transmission of electric energy by Florida."

The concurrent findings of the Presiding Examiner (App. 281-82) and the Commission (App. 299-300) on this point are not only persuasive in their exposition of the facts, they are conclusive as a matter of law. Federal Power Act § 313(b), 16 U.S.C. § 825*l*(b) (1964).

As to related questions of law, the experienced judgment of the Commission, in its interpretation of the statute as applied to the highly technical factual problem involved here, must be given great weight. *SEC* v. *New England Electric System,* 384 U.S. 176 (1966); *Atlantic Refining Co.* v. *FTC,* 381 U.S. 357 (1955); *Gray* v. *Powell,* 314 U.S. 402 (1941).

B. The Company's public utility status is established by its ownership of facilities for transmission of energy in interstate commerce. That being so, it is not necessary to establish that it is also selling energy in interstate commerce.

Section 201(b) directs that the provisions of Part II of the Act apply, in the disjunctive, to (1) transmission of electric energy in interstate commerce, and (2) the sale of electric energy at wholesale in interstate commerce. Unless Section 313(b) is ignored and rejected, it necessarily follows as a matter of law from the Commission's findings of fact that Florida Power & Light Co. is indeed a public utility within the meaning of Section 201(e), because it owns or operates facilities for the transmission of electric energy in interstate commerce. Ownership of facilities for such transmission is enough to require an affirmative answer to the jurisdictional question. The only question involved here is whether the Company is a public utility within the meaning of Section 201(e). As the Examiner pointed out (App. 255), we are not concerned here as to whether a particular sale is a sale of energy in interstate commerce, and, therefore, we are not concerned with the question of whether, to prove that a particular sale to a particular customer is one in interstate commerce, it is necessary to trace energy from out-of-state to that customer. We think that it is not, but this case does not require an answer to that problem.

The court in *Hartford Electric Light Co.* v. *FPC*, 131 F.2d 953 (2d Cir. 1942), *cert. denied*, 319 U.S. 741 (1943), reasoned that: "Section 201(b) confers jurisdiction over not only facilities (1) for interstate *transmission* but also—and *disjunctively*—over facilities (2) for interstate wholesale *sales.*" 131 F.2d at 961.

If Florida is a public utility in consequence of its interconnection with an interstate power grid, i.e., because it owns facilities for interstate transmission, the question of the quantity of energy which may pass in either direction is quite immaterial. *Connecticut Light & Power Co.* v. *FPC*, 324 U.S. 515 (1945); *Wisconsin-Michigan Power Co.* v. *FPC*, 197 F.2d 472 (7th Cir. 1952), *cert. denied*, 345 U.S. 934 (1953).

As the Court said in *Connecticut:*

> "We do not find that Congress has conditioned the jurisdiction of the Commission upon any particular volume or proportion of interstate energy involved, and we do not think it would be appropriate to supply such a jurisdictional limitation by implication." 324 U.S. at 536.

It cannot be seriously contended that Florida's lines which interconnect its system with Corps' (which in turn is interconnected with the 140 systems in 32 states in the Interconnected Systems Group) are facilities engaged solely in "local distribution or only for the transmission of electric energy in intrastate commerce," within the proviso to Section 201(b). *Cf. Wisconsin-Michigan Power Co.* v. *FPC*, 197 F.2d 472, 477 (7th Cir. 1952), *cert. denied*, 345 U.S. 934 (1953); *FPC* v. *Arizona Edison Co.*, 194 F.2d 679, 681 (9th Cir. 1952).

C. The decision below is contrary to decisions of this Court and of other Circuit Courts of Appeals.

The question of whether a company which owned and operated transmission facilities as part of an interstate pool was a public utility under Section 201(e) came before this Court in *Jersey Central Power & Light Co.* v. *FPC*, 319 U.S. 61 (1943). The factual situation was

comparable to that in the present case. Jersey Central owned a transmission line from its substation adjacent to its generating plant in New Jersey. The line extended to a point in New Jersey where it joined the transmission facilities of a company (Public Service) not involved in the case. This latter company owned transmission facilities extending to midchannel between New Jersey and New York. At that point, Staten Island Edison Corporation, another utility, connected with its transmission system in New York. The Commission found that energy generated in New Jersey by Jersey Central was consumed in New York and that energy generated in New York was consumed in New Jersey. It held that Jersey Central was a public utility under the Federal Power Act. The Supreme Court said:

> "The connection between Public Service and Staten Island is maintained primarily to guard the Staten Island distribution against breakdown. It is used for emergencies a few times per year on an average. Surplus energy is occasionally sold. The rest of the time the line is maintained 'in balance.' This is to avoid a delay of transmission in an emergency. If the connection were not maintained, an appreciable time would be lost in communicating and re-establishing the connection. Any oscillation of the balance, created by increased demand in New York or New Jersey, carries energy in one direction or in another to be consumed on one side or the other of the line between the states. This is called 'slop-over' energy." 319 U.S. at 65.
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> * * * *
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> "The amount of energy transmitted was small. The evidence was developed from 184 log readings selected from 25,000. Of the 184 log readings, 12

showed this flow of energy from Jersey Central to New York between August 26, 1935, . . . and March 14, 1938, the date of the present purchase of the stock. Twelve showed such flow shortly after the purchase.

"This evidence, we think, furnishes substantial basis for the conclusion of the Commission that facilities of Jersey Central are utilized for the transmission of electric energy across state lines." *Id.* at 66-67.

The Court, in a footnote, quoted Section 313(b): "The findings of the Commission as to the facts, if supported by substantial evidence, shall be conclusive." 319 U.S. at 67, n. 5.

In *Pennsylvania Water & Power Co.* v. *FPC,* 343 U.S. 414 (1952), as here, the question was whether the company was a public utility, not whether a particular sale was one in interstate commerce. The Commission found that it, with two other companies, was party to an agreement under which: "A complete integration and pooling of the power producing and transmitting facilities of the three companies was thus achieved." 343 U.S. at 419-20. The Court continued, quoting from the Commission's opinion:

"It is accordingly evident that the operations of the unified system enterprise are completely interstate in character, notwithstanding the fact that system energy transactions at some particular times may involve energy never crossing the State boundary." 343 U.S. at 420.

On these facts, said the Court:

"We hold that the Federal Power Commission has complete authority to regulate all of this commingled power flow. The Commission's power

does not vary with the rise and fall of the Susquehanna River." *Id.*

* * * *

"Moreover, the Commission found here ready-made by prior contractual arrangements a regional coordination of power facilities of precisely the type which the Commission is authorized to require under § 202." *Id.* at 423.

In *Connecticut Light & Power Co.* v. *FPC*, 324 U.S. 515 (1945), the Court said that the company, which had operated as a member of an interstate pool which interchanged energy among certain systems in New York, Massachusetts and Connecticut, had "rearranged its operations with intent to cut every connection and discontinue every facility whose continued operation would render it subject to the Federal Power Commission's control," and had succeeded in that objective. 324 U.S. at 518. But, the Court said: "[H]ad such operation continued, the Company would be subject to the Act and to the Commission's order." *Id.* The Court continued: "The order must stand or fall on whether this company owned facilities that were used in transmission of interstate power and were not facilities used in local distribution." *Id.* at 531.

We have taken care to point out that the question in this case is whether the Company is a public utility within the meaning of Section 201(e), not whether a particular sale is a sale in interstate commerce within the meaning of Section 205. The Company's "status as a public utility does not decide the question whether the F.P.C. may assert jurisdiction over the rates" of a particular sale by the Company. *FPC* v. *Southern California Edison Co.*, 376 U.S. 205, 208 n. 3 (1964), citing *Connecticut Light & Power Co.* v. *FPC*, 324 U.S.

515 (1945). A particular sale by a public utility may not be a sale of energy in interstate commerce.

But the converse is not true. If a sale of energy is held to be a sale in interstate commerce, it follows automatically, by the terms of Section 201(b), that the Company is a public utility within the meaning of Section 201(e).[9] For that reason, a group of cases relating to power sales from interstate pools is in point.

In *Pennsylvania Water & Power Co.* v. *FPC,* 193 F. 2d 230 (D.C. Cir. 1951) *aff'd* 343 U.S. 414 (1952), the Court of Appeals said: "Each sale is in effect a pool sale from the integrated system and hence interstate in nature." 193 F.2d at 241.

In *Indiana & Michigan Electric Co.* v. *FPC,* 365 F.2d 180 (7th Cir.), *cert. denied,* 385 U.S. 972 (1966), the Court of Appeals sustained the Commission's order which required the company to file rate schedules covering sales to certain municipal electric systems and cooperatives, all in Indiana. The question was whether these were sales in interstate commerce. The court found that the company, with five others, "is an integral part of the American Electric Power System (AEP), a single coordinated power system operating as an integrated unit in Michigan, Indiana, Ohio, Kentucky, West Virginia, Virginia, and Tennessee, with generating facilities combined by an inter-connected transmission grid." 365 F.2d at 181-82.

The court said: "We think the Commission was justified in holding that the important consideration in determining jurisdiction here is the integrated inter-

[9] The exotic question of whether a company can be a public utility with respect to some of its operations but not others is not involved here.

state pool character of the operation." *Id.* at 184. The court continued:

> "We reject I&M's fundamental proposition in this case that in order to prevail, the Federal Power Commission must do what I&M claims to be impossible, that is, to prove by either tracing or some other unnamed 'scientific and engineering proof' that out-of-state energy reaches the wholesale customers. We might recall that even in criminal cases, guilt beyond a reasonable doubt often can be established by circumstantial evidence." *Id.*

In *Arkansas Power & Light Co.* v. *FPC*, 368 F.2d 376 (8th Cir. 1966), the court said:

> "The Commission asserts, however, that the teachings of the Supreme Court clearly establish that where, as here, there is an integrated, interstate pool operation, jurisdiction may be proved without resort to tracing studies. We agree with the Commission and affirm.
>
> "We are not prepared to say that detailed tracing studies are a sine qua non to the conferral of federal jurisdiction where there exists an integrated, interstate 'pool assist' operation as in the present case." 368 F.2d at 379.

In *Public Service Company of Indiana* v. *FPC*, 375 F.2d 100 (7th Cir.), *cert. denied*, 387 U.S. 931 (1967), the court sustained the Commission's regulating rates charged by the company in sales to municipal and cooperative customers. The court described the company as operating entirely within Indiana, interconnected with six other public utilities at points within Indiana or at the state line. Three of these served areas outside Indiana.

The Commission had found that the company was interconnected with a single multi-state integrated power system. In fact, as the court found, it is "the same interstate network to which I&M and Arkansas Light & Power are interconnected." 375 F.2d at 103. *Cf. Arkansas Power & Light Co.* v. *FPC*, 368 F.2d 376 (8th Cir. 1966); *Indiana & Michigan Electric Co.* v. *FPC*, 365 F.2d 180 (7th Cir.), *cert. denied*, 385 U.S. 972 (1966).

The court continued:

> "Its participation in this pool by virtue of its interconnections, even though only for economy and emergency purposes, results in the introduction of a substantial amount of out-of-state energy into PSCI's system." 375 F.2d at 103.

In its footnote to this statement the court said:

> "The Commission rejected the contention that the net flow of energy into the system (0.1% of PSCI's total energy requirements) was controlling in determining the existence of out-of-state energy in the sales to the Municipals and REMCs [Cooperatives]. We think this was a permissible administrative interpretation of the Act, especially in view of the benefits accruing to PSCI under the pooling arrangement. *Cf.* Pennsylvania Water & Power Co. v. FPC, 343 U.S. 414 (1952). These benefits include increased reliability, reduced costs and reduction of its 'spinning reserves.'" 375 F.2d at 103 n. 4.

The court's opinion continued:

> "The proof in the record before us is sufficient to support an inference, to a reasonable scientific certainty, that interstate energy entered all of the sales in question and commingled with PSCI-generated energy." *Id.* at 103.

In *Cincinnati Gas & Electric Co.* v. *FPC*, 376 F.2d 506 (6th Cir.), *cert. denied*, 389 U.S. 842 (1967), the court sustained an order requiring the company and its affiliate to file with the Commission rate schedules covering their wholesale sales to eight municipalities. The two companies conceded that they were public utilities within the meaning of the Act. The court found that these companies were part of a coordinated and interconnected electric system, serving nine counties in Ohio, five in Kentucky, and one in Indiana; the system is connected with eight other utility companies in those three states. All of the companies are part of the Interconnected Systems Group, consisting of 140 utility systems in 32 states.[10]

The court said:

> "There can be no question but that interstate as well as intrastate generated electricity was commingled and was flowing through the CG&E system. This is enough to sustain the Commission's jurisdiction.
>
> "It would indeed be impossible to prove the source of electrical current supplied from a pool. It was not necessary for the Commission to do so." 376 F.2d at 508.

II. THE COURT BELOW ERRONEOUSLY CAST UPON THE COMMISSION A BURDEN OF PROOF WHICH IS NOT RELEVANT TO ITS JURISDICTION, AND WHICH CANNOT BE MET.

The court below, while rejecting the Commission's finding that electromagnetic unity of response of interconnected systems to loads in other states constituted interstate transmission of energy, never made very

[10] So is Florida Power Corporation, in our case, with which Florida Power & Light Co. is interconnected. (App. 287-88.)

clear just what proof it would recognize. Apparently, it demands proof that out-of-state energy can be traced, through systems interconnected in a power pool, to a specific customer.

A. The question of whether power originating in one of many interconnected generators can be traced to a specific consumer in another state is irrelevant.

As previously noted, the resolution of the question of whether Florida Power & Light Co. is a public utility within the meaning of the Act does not turn on whether it is engaged in making interstate sales, but on whether it owns facilities for interstate transmission.

Sixty-cycle alternating current changes its direction of flow 60 times a second. This change takes place throughout a system, with the speed of light. When two or more such systems are interconnected, this reversal takes place instantaneously throughout all of them, back and forth between all the generators in the system. Generation in the systems may be maintained in balance so that there is net transfer of energy in either direction, yet the electricity is pulsing between all generators in all systems, reversing its direction 60 times per second. The spinning generators in all systems are instantly available to effectuate a net flow of current if the load should increase in any segment of the interconnected systems. Thus the transmission lines which effectuate this interconnection are facilities for interstate transmission of energy, whether at any given moment, or during any given month, they are called upon to deliver a net amount of energy in either direction. They are "live wires"—the life in them pulses constantly from one end of the combined systems to the other. Two companies which mutually undertake to make stated quantities of reserve generating capacity available to one another for use in emergency or during

shut-downs for maintenance, thereby saving the duplicate investment that each would have to make in reserve capacity if it could not call upon that of the other, must maintain a transmission interconnection to effectuate this saving. Since such transmission facilities exist to make possible the transmission of energy in interstate commerce, whether or not energy is ever actually exchanged, they are facilities for interstate transmission of energy. After such a connection is established, the Commission's jurisdiction is not suspended in mid-air, awaiting the first emergency which occasions a net transfer of energy before being called into existence, and then vesting only upon proof that specific quantities from specific generators reached specific customers in another state. Such a "construct," to borrow the lower court's word, is not "in consonance with the reach and realities of modern interconnected systems," to borrow the Examiner's expression (App. 281).

In *Public Service Co. of Indiana* v. *FPC, supra,* the court quoted the Commission's opinion with approval:

> "As we observed in that case [Arkansas Power & Light Co.], it is an oversimplification to talk in terms of a flow of electricity from point to point in an integrated power network. Instead, generation from each source in the system contributes directly or indirectly, and to an ever varying extent, to the energy present in all parts of the system which are not isolated from out-of-state sources." 375 F.2d at 103 n. 6.

In *Arkansas Power & Light Co.* v. *FPC, supra,* the question was whether particular sales were sales in interstate commerce. The court said:

> "The Commission asserts, however, that the teachings of the Supreme Court clearly establish

that where, as here, there is an integrated, interstate pool operation, jurisdiction may be proved without resort to tracing studies. We agree with the Commission and affirm." 368 F.2d at 379.

* * * *

"While the Supreme Court has reiterated that 'federal jurisdiction was to follow the flow of electric energy, an engineering and scientific, rather than a legalistic or governmental test,' [*Connecticut Light and Power*] we do not construe this language as requiring the employment of tracing studies in every instance. While this standard was applied in Federal Power Commission v. Southern California Edison Co. (The *Colton* case), 376 U.S. 205 (1964), it seems clear that the Supreme Court there was not confronted with the highly integrated, interconnected pool operation that characterizes the Middle South System." *Id.*

* * * *

"Logic would seem to dictate that where the utility is a member of a combination of utilities and has continuous access to an integrated pool of interstate energy, the tracing of out-of-state energy is indeed difficult, burdensome, and perhaps impossible.". *Id.* at 382.

The Court quoted at length, with approval, from the Commission's opinion in the same case (34 F.P.C. at 751). In that opinion, as quoted by the Court, the Commission said, *inter alia*:

". . . the more complex and comprehensive the nature of the interstate network, the more unlikely it will be that any energy sources will be measurably identifiable. The use of tracing to disprove that a particular sale of a company which is part of an electrically integrated interstate system is in interstate commerce is a wholly unrealistic methodology which is irrelevant to present day power system technology." *Id.* at 382.

The simplest demonstration that tracing is irrelevant to the decision of the question whether certain transmission facilities are facilities for transmission of energy in interstate commerce is afforded by a proceeding to compel an interconnection under Section 202(b). Manifestly, until the case is won and an interconnection is made, no energy can be traced to the municipality seeking the interconnection. Yet, by the specific terms of Sections 201(b) and 202(b), the Commission has power to compel it if the transmission facilities with which the municipality seeks to interconnect are facilities *for* the transmission of energy in interstate commerce.

B. Such a burden of proof cannot be met, with respect to large interconnected systems.

The Presiding Examiner made it clear why tracing is impossible where power produced by several utilities is pooled.

> "The nature of electric energy is not clearly understood. It is sometimes described as a field of force or as a jostling motion of electrons. Where electric energy from two sources has combined, there is no way to identify a particular portion with a particular source. Electric energy is unlike a liquid, gas or solid, whose path can be traced by methods such as, dyeing one stream of the liquid, chemical analysis, tracing radioactive atoms.
>
> "In certain simple situations it can be proved that electric energy, or at least an undivided part of the whole, comes from a particular source. Thus a load of 100 kw, C, is supplied from a bus which receives 50 kw from each of two sources, A and B. Plainly the load is receiving electric energy from both A and B. The proof here is logical or mathematical. It does not involve knowledge or application of the physics of electric energy. That the

> energy at C comes from both A and B is both a sufficient and a necessary explanation. However, in modern electric systems such as those of Florida, such methods of logical analysis of the raw data are not applicable. There is too much commingling from different sources in the buses, and the systems are so complex that there are many possible sources which could account for the amount of electric energy at any point. In these circumstances, several explanations may be sufficient but none may possess the uniqueness necessary for proof." (App. 271-72.) (Examiner's footnote omitted.)

III. THE REGULATION OF THE FACILITIES OF AN INTERSTATE POWER GRID IS BEYOND THE CONSTITUTIONAL POWERS OF A SINGLE STATE. THE DECISION OF THE COURT BELOW WOULD RECREATE THE "ATTLEBORO GAP" BY CONSTRUING THE FEDERAL POWER ACT SO AS TO DENY THE FEDERAL POWER COMMISSION'S STATUTORY AUTHORITY TO REGULATE SUCH FACILITIES, EXCEPT ON PROOF THAT POWER PRODUCED BY A SPECIFIC GENERATOR CAN BE TRACED TO A SPECIFIC CUSTOMER, A TASK IMPOSSIBLE OF ACHIEVEMENT.

The Supreme Court said, in *Public Utilities Commission* v. *Attleboro Steam & Electric Co.*, 273 U.S. 83 90 (1927):

> "Plainly, however, the paramount interest in the interstate business carried on between the two companies is not local to either State, but is essentially national in character. The *rate* is therefore not subject to regulation by either of the two States in the guise of protection to their respective local interests; but, if such regulation is required it can only be attained by the exercise of the power vested in Congress." (Emphasis added.)

Substitute "interchange" for "rate" in the quotation, and we have the present case. Congress has exer-

cised the power vested in it, and did not intend to leave or create another Attleboro Gap, this time with respect to the subject of participation in interstate transmission grids.

In *United States* v. *Public Utilities Commission of California,* 345 U.S. 295, 308 (1953), the Court said: "Congress interpreted that case [Attleboro] as prohibiting state control of wholesale rates in interstate commerce for resale, and so armed the Federal Power Commission with precisely that power."

The Court continued:

> "Part II [of the Power Act] is a direct result of Attleboro. They are to be read together. The latter left no power in the states to regulate licensees' sales for resale in interstate commerce, while the former established federal jurisdiction over such sales." *Id.* at 311.

In *FPC* v. *Southern California Edison Co., supra* (The *Colton* case), the Court, noting that the Company was concededly a public utility within the meaning of Section 201(e) of the Federal Power Act, had before it the question of whether a sale at wholesale to the City of Colton was a sale in interstate commerce. The resolution of that question turned on whether power received into the Company's lines at Hoover and Davis Dams, outside California, reached Colton, a city in California. The Commission had held that it did, basing this finding on evidence that power from this source could be traced to Colton. The Court of Appeals for the Ninth Circuit set aside the F.P.C. order (310 F.2d 784), but the Supreme Court reversed. Holding that there was substantial evidence to support the Commission's determination that out-of-state energy

reached Colton, the Court rejected the Court of Appeals' construction of the proviso of Section 201(a) "as requiring an appraisal in each case of the impact of the particular sale." The Supreme Court said:

> "In short, our decisions have squarely rejected the view of the Court of Appeals that the scope of FPC jurisdiction over interstate sales of gas or electricity at wholesale is to be determined by a case-by-case analysis of the impact of state regulation upon the national interest. Rather, Congress meant to draw a bright line easily ascertained, between state and federal jurisdiction, making unnecessary such case-by-case analysis. This was done in the Power Act by making FPC jurisdiction plenary and extending it to all wholesale sales except those which Congress has made explicitly subject to regulation by the States." 376 U.S. at 215-16.

We say that this conclusion inescapably applies to facilities for transmission in interstate commerce as to facilities for sale of electric energy at wholesale in interstate commerce, these being the twin criteria for Commission jurisdiction stated in Section 201(b).

The Court bracketed those twin criteria of the Act in this fashion:

> "The premise was that constitutional limitations upon state regulatory power made federal regulation essential if major aspects of interstate transmission and sale were not to go unregulated." *Id.* at 213.

In *Jersey Central,* the line did not cross state borders and since it was wholly within one state it was contended that the line was used for intrastate transmission and that the Act did not apply although the line

was used to transmit power in its course of exportation from the state. The Court denied this contention, and said: "Subsections (a) and (b) [of Sec. 201] show the intent to regulate such transactions as are beyond state power under the Attleboro Steam & Electric Case, 273 U.S. 83. . . ." 319 U.S. at 70-71. The Court continued:

> "It is impossible for us to conclude that this definition [Sec. 201(e)] means less than it says and applies only to the energy at the instant it crosses the state line and so only to the facilities which cross the line and only to the company which owns the facilities which cross the line. The purpose of this act was primarily to regulate the rates and charges of the interstate energy. If intervening companies might purchase from producers in the state of production, free of federal control, cost would be fixed prior to the incidence of federal regulation and federal rate control would be substantially impaired, if not rendered futile." *Id.* at 71-72.

Essential elements of regulation of an interstate power pool, other than rates and charges, are "beyond the state power under the Attleboro Steam & Electric Co. Case. . . ." *Id.* These include a myriad of technical matters which must be resolved to make possible the integration of power systems in many states to prevent blackouts in any one of them.

Congress surely contemplated this when, in Section 202(a), it gave the Commission these prescient instructions:

> "(a) For the purpose of assuring an abundant supply of electric energy throughout the United States with the greatest possible economy and with regard to the proper utilization and conservation of natural resources, the Commission is empowered

> and directed to divide the country into regional districts for the voluntary interconnection and coordination of facilities for the generation, transmission, and sale of electric energy, and it may at any time thereafter, upon its own motion or upon application, make such modifications thereof as in its judgment will promote the public interest. Each such district shall embrace an area which, in the judgment of the Commission, can economically be served by such interconnected and coordinated electric facilities. It shall be the duty of the Commission to promote and encourage such interconnection and coordination within each such district and between such districts. . . ."

Additionally Congress, in Section 202(b), authorized the Federal Power Commission to compel interconnections of public utilities to accomplish that purpose of "assuring an abundant supply of electric energy throughout the United States with the greatest possible economy and with regard to the proper utilization and conservation of natural resources."

Congress intended to give the Commission the power to carry out those instructions.

CONCLUSION

The larger the interstate pool, the greater the need for federal regulation. But, the larger the pool (here systems in 32 states are interconnected), the greater the difficulty of tracing energy from a specific generator to a specific customer. The court below, however, apparently believes that energy must be so traced to establish the interconnected systems as public utilities subject to regulation under the Federal Power Act. So, on the lower court's reasoning, the greater the need for federal regulation, the greater the obstacle

to establishing it. We think this is an erroneous construction of the Federal Power Act. The Examiner and the Commission made the sound construction: that the electromagnetic unity of response of all interconnected systems to all loads on all systems ipso facto constitutes interstate transmission of electric energy, without legal necessity for performance of the engineeringly impossible task of tracing it from each generator to each user. This being so, the Act applies to facilities for effectuating such transmission under Section 201 (b), and the owners or operators of such facilities are public utilities within the meaning of Section 201(e).

The judgment of the Court of Appeals should be reversed, and the case remanded to that court with instructions to affirm the opinion and order of the Federal Power Commission.

Respectfully submitted,

NORTHCUTT ELY
1200 Tower Building
Washington, D. C. 20005
General Counsel for the American Public Power Association.

May 21, 1971

APPENDIX

STATUTES

Federal Power Act § 201(a), 16 U.S.C. § 824(a) (1964)

(a) It is declared that the business of transmitting and selling electric energy for ultimate distribution to the public is affected with a public interest, and that Federal regulation of matters relating to generation to the extent provided in sections 824-825r of this title and of that part of such business which consists of the transmission of electric energy in interstate commerce and the sale of such energy at wholesale in interstate commerce is necessary in the public interest, such Federal regulation, however, to extend only to those matters which are not subject to regulation by the States.

Federal Power Act § 201(b), 16 U.S.C. 824(b) (1964)

(b) The provisions of sections 824-824h of this title shall apply to the transmission of electric energy in interstate commerce and to the sale of electric energy at wholesale in interstate commerce, but shall not apply to any other sale of electric energy or deprive a State or State commission of its lawful authority now exercised over the exportation of hydroelectric energy which is transmitted across a State line. The Commission shall have jurisdiction over all facilities for such transmission or sale of electric energy, but shall not have jurisdiction, except as specifically provided in said sections, over facilities used for the generation of electric energy or over facilities used in local distribution or only for the transmission of electric energy in intrastate commerce, or over facilities for the transmission of electric energy consumed wholly by the transmitter.

Federal Power Act § 201(e), 16 U.S.C. 824(e) (1964)

(e) The term "public utility" when used in sections 824-825r of this title means any person who owns or operates facilities subject to the jurisdiction of the Commission under Sections 824-824h of this title.

Federal Power Act § 202(b), 16 U.S.C. 824a(b) (1964)

(b) Whenever the Commission, upon application of any State commission or of any person engaged in the transmission or sale of electric energy, and after notice to each State commission and public utility affected and after opportunity for hearing, finds such action necessary or appropriate in the public interest it may by order direct a public utility (if the Commission finds that no undue burden will be placed upon such public utility thereby) to establish physical connection of its transmission facilities with the facilities of one or more other persons engaged in the transmission or sale of electric energy, to sell energy to or exchange energy with such persons: *Provided,* That the Commission shall have no authority to compel the enlargement of generating facilities for such purposes, nor to compel such public utility to sell or exchange energy when to do so would impair its ability to render adequate service to its customers. The Commission may prescribe the terms and conditions of the arrangement to be made between the persons affected by any such order, including the apportionment of cost between them and the compensation or reimbursement reasonably due to any of them.

Federal Power Act § 205, 16 U.S.C. 824d (1964)

(a) All rates and charges made, demanded, or received by any public utility for or in connection with the transmission or sale of electric energy subject to the jurisdiction of the Commission, and all rules and regulations affecting or pertaining to such rates or charges shall be just and reasonable, and any such rate or charge that is not just and reasonable is hereby declared to be unlawful.

(b) No public utility shall, with respect to any transmission or sale subject to the jurisdiction of the Commission, (1) make or grant any undue preference or advantage to any person or subject any person to any undue prejudice or disadvantage, or (2) maintain any unreasonable differ-

ence in rates, charges, service, facilities, or in any other respect, either as between localities or as between classes of service.

(c) Under such rules and regulations as the Commission may prescribe, every public utility shall file with the Commission, within such time and in such form as the Commission may designate, and shall keep open in convenient form and place for public inspection schedules showing all rates and charges for any transmission or sale subject to the jurisdiction of the Commission, and the classifications, practices, and regulations affecting such rates and charges, together with all contracts which in any manner affect or relate to such rates, charges, classifications, and services.

(d) Unless the Commission otherwise orders, no change shall be made by any public utility in any such rate, charge, classification, or service, or in any rule, regulation, or contract relating thereto, except after thirty days' notice to the Commission and to the public. Such notice shall be given by filing with the Commission and keeping open for public inspection new schedules stating plainly the change or changes to be made in the schedule or schedules then in force and the time when the change or changes will go into effect. The Commission, for good cause shown, may allow changes to take effect without requiring the thirty days' notice herein provided for by an order specifying the changes so to be made and the time when they shall take effect and the manner in which they shall be filed and published.

(e) Whenever any such new schedule is filed the Commission shall have authority, either upon complaint or upon its own initiative without complaint, at once, and, if it so orders, without answer or formal pleading by the public utility, but upon reasonable notice, to enter upon a hearing concerning the lawfulness of such rate,

charge, classification, or service; and, pending such hearing and the decision thereon, the Commission, upon filing with such schedules and delivering to the public utility affected thereby a statement in writing of its reasons for such suspension, may suspend the operation of such schedule and defer the use of such rate, charge, classification, or service, but not for a longer period than five months beyond the time when it would otherwise go into effect; and after full hearings, either completed before or after the rate, charge, classification, or service goes into effect, the Commission may make such orders with reference thereto as would be proper in a proceeding initiated after it had become effective. If the proceeding has not been concluded and an order made at the expiration of such five months, the proposed change of rate, charge, classification, or service shall go into effect at the end of such period, but in case of a proposed increased rate or charge, the Commission may by order require the interested public utility or public utilities to keep accurate account in detail of all amounts received by reason of such increase, specifying by whom and in whose behalf such amounts are paid, and upon completion of the hearing and decision may by further order require such public utility or public utilities to refund, with interest, to the persons in whose behalf such amounts were paid, such portion of such increased rates or charges as by its decision shall be found not justified. At any hearing involving a rate or charge sought to be increased, the burden of proof to show that the increased rate or charge is just and reasonable shall be upon the public utility, and the Commission shall give to the hearing and decision of such questions preference over other questions pending before it and decide the same as speedily as possible.

Federal Power Act § 206, 16 U.S.C. 824e (1964)

(a) Whenever the Commission, after a hearing had upon its own motion or upon complaint, shall find that any rate, charge, or classification, demanded, observed, charged, or collected by any public utility for any transmission or sale subject to the jurisdiction of the Commission, or that any rule, regulation, practice, or contract affecting such rate, charge, or classification is unjust, unreasonable, unduly discriminatory or preferential, the Commission shall determine the just and reasonable rate, charge, classification, rule, regulation, practice, or contract to be thereafter observed and in force, and shall fix the same by order.

(b) The Commission upon its own motion, or upon the request of any State commission whenever it can do so without prejudice to the efficient and proper conduct of its affairs, may investigate and determine the cost of the production or transmission of electric energy by means of facilities under the jurisdiction of the Commission in cases where the Commission has no authority to establish a rate governing the sale of such energy.

Federal Power Act § 313(b), 16 U.S.C. 825l(b) (1964)

(b) Any party to a proceeding under this chapter aggrieved by an order issued by the Commission in such proceeding may obtain a review of such order in the United States Court of Appeals for any circuit wherein the licensee or public utility to which the order relates is located or has its principal place of business, or in the United States Court of Appeals for the District of Columbia, by filing in such court, within sixty days after the order of the Commission upon the application for rehearing, a written petition praying that the order of the Commission be modified or set aside in whole or in part. A copy of such petition shall forthwith be transmitted by the clerk of the court to any member of the Commission and thereupon the Com-

mission shall file with the court the record upon which the order complained of was entered, as provided in section 2112 of Title 28. Upon the filing of such petition such court shall have jurisdiction, which upon the filing of the record with it shall be exclusive, to affirm, modify, or set aside such order in whole or in part. No objection to the order of the Commission shall be considered by the court unless such objection shall have been urged before the Commission in the application for rehearing unless there is reasonable ground for failure so to do. The finding of the Commission as to the facts, if supported by substantial evidence, shall be conclusive. If any party shall apply to the court for leave to adduce additional evidence, and shall show to the satisfaction of the court that such additional evidence is material and that there were reasonable grounds for failure to adduce such evidence in the proceedings before the Commission, the court may order such additional evidence to be taken before the Commission and to be adduced upon the hearing in such manner and upon such terms and conditions as to the court may seem proper. The Commission may modify its findings as to the facts by reason of the additional evidence so taken, and it shall file with the court such modified or new findings which, if supported by substantial evidence, shall be conclusive, and its recommendation, if any, for the modification or setting aside of the original order. The judgment and decree of the court, affirming, modifying, or setting aside, in whole or in part, any such order of the Commission, shall be final, subject to review by the Supreme Court of the United States upon certiorari or certification as provided in sections 346 and 347 of Title 28.

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1970

No. 958

FEDERAL POWER COMMISSION,

Petitioner,

v.

FLORIDA POWER & LIGHT COMPANY,

Respondent.

ON WRIT OF CERTIORARI TO THE
UNITED STATES COURT OF APPEALS
FOR THE FIFTH CIRCUIT

BRIEF FOR THE RESPONDENT FLORIDA POWER & LIGHT COMPANY

LEON JAWORSKI
JEFFERSON D. GILLER
JAY W. ELSTON
FULBRIGHT, CROOKER & JAWORSKI
800 Bank of the Southwest Building
Houston, Texas 77002
HARRY A. POTH, JR.
RICHARD M. MERRIMAN
REID & PRIEST
1701 "K" Street, N.W.
Washington, D.C. 20006
Attorneys for Respondent

July, 1971

FIDELITY PRINTING COMPANY, INC., HOUSTON

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1970

No. 958

FEDERAL POWER COMMISSION,

Petitioner,

v.

FLORIDA POWER & LIGHT COMPANY,

Respondent.

ON WRIT OF CERTIORARI TO THE
UNITED STATES COURT OF APPEALS
FOR THE FIFTH CIRCUIT

BRIEF FOR THE RESPONDENT FLORIDA POWER & LIGHT COMPANY

PETITIONER'S STATEMENTS

The Brief of the Federal Power Commission adequately refers to the opinions below, the jurisdictional requisites, and the statutory provisions involved.

QUESTION PRESENTED

The Commission has asserted jurisdiction over Florida Power & Light Company ("FPL") as a "public utility" alleging that it operates facilities which transmit electric energy in interstate commerce. The Court of Appeals held

that the Commission had failed to carry its burden of proving "transmission of electric energy *in* interstate commerce" to or from the facilities of FPL. For the convenience of the Court the opinion below is attached as Exhibit A, paginated as in the Appendix.

FPL objects to the form of the Question Presented because it does not correctly reflect the jurisdictional requirements of the statute. Accordingly, FPL submits the following question as the one correctly here before this Court:

> "Whether the Court of Appeals correctly held that the Federal Power Commission failed to carry its burden to prove that there had been a 'transmission of electric energy *in* interstate commerce' to or from the facilities of Florida Power & Light Company so as to subject it to the Commission's regulatory jurisdiction."

STATEMENT

The Statement of the Commission is generally correct although argumentative in certain particulars, especially in its discussion and analysis of the connections of FPL with other electric companies. The Statement also omits certain facts which FPL deems relevant to a determination of the issue in this case, that is, whether or not FPL is a "public utility" subject to the jurisdiction of the Commission."[1]

A. The Business of Florida Power & Light Company

It should be kept in mind that FPL is basically in the distribution business. Although the exemption of the local

[1] The Federal Power Act defines a "public utility" as one owning or operating facilities used in "the transmission of electric energy in interstate commerce." (Section 201(e) of the Federal Power Act, 49 Stat. 847, 16 U.S.C. § 824). FPL in common parlance, is, of course, a public utility and is so recognized by the state regulatory agency, the Florida Public Service Commission.

distribution facilities from Commission jurisdiction is not involved in this case, virtually all of FPL's customers are also consumers. Of FPL's 931,400 customers mentioned by the Commission, all but 6 are retail sales. (App. 10). The 6 wholesale sales are to local cooperatives, and together account for less than 1% of FPL's revenues from sales of electric energy. FPL is not in the *business of buying and reselling* electric energy at either retail or wholesale, either intrastate or interstate.

As noted by the Commission, all of FPL's facilities lie wholly within the State of Florida, as do the facilities of all four electric systems with whom FPL has connections. Further, 75% of FPL's electric load is located at the extreme southern end of the peninsula between West Palm Beach and Miami, approximately 400 miles south of the Georgia border. (App. 74).

Because of the unique peninsular location of FPL's system and the frequency and severity of lightning storms and hurricanes, FPL has always designed and operated its system in such a way that it is not and will not be dependent upon others to supply any part of its predictable load. (App. 63, 71).

B. Electrical Terms and Systems

We believe it essential to this case that certain electrical terms and facts be understood. While there are certain phenomena of *electricity* that are not easily understood, there are certain facts and characteristics of the generation, transmission and use of *electric energy* which are accepted in the industry, and it is upon these that FPL relies.

Since the controlling issue in the case is whether "electric energy" is transmitted in interstate commerce, its defini-

tion is important. It is defined by the Commission as follows:

> "ENERGY—that which does or is capable of doing work. It is measured in terms of the work it is capable of doing; electric energy is usually *measured in kilowatt-hours.*"[2]

Electric energy is what all of us as householders pay for each month—so many kilowatt-hours as measured by a watt hour meter.

Since electric energy cannot be stored or accumulated in any kind of receptacle, a generator does not generate any more electric energy in any one moment of time than it is called upon to do so by the electric load to which it is supplying energy.

When one or more generators are supplying electric energy to a load in one direction through an electric circuit, there cannot be a flow of electric energy from other generators in the opposite direction through the same circuit.[3]

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[2] *Glossary of Important Power and Rate Terms, Abbreviations, and Units of Measurements* promulgated by the FPC in 1965 p. 6.

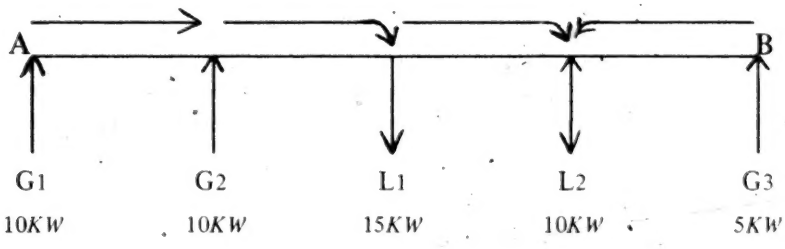
The following similar, but shorter definition is found in a publication of the Edison Electric Institute:

> *"ENERGY, ELECTRIC.* As commonly used in the electric utility industry, electric energy means kilowatt hours."

Glossary of Electric Utility Terms prepared by the Statistical Committee of the Edison Electric Institute, 750 Third Avenue, New York, New York, p. 32. Emphasis supplied throughout unless otherwise indicated.

[3] The Commission's expert witness agrees. App. 47, 48.

This fact is of considerable importance in this case and can be illustrated by the following diagram.



In the diagram, the line A-B is a three phase transmission line, the generators are indicated by "G", the loads by "L" and the size of the generators and loads are given below them. The arrows show the direction of flow of electric energy in the transmission line A-B. Of the twenty kilowatts produced by the generators G_1 and G_2, fifteen of it will be used by the load L_1 and the other five will go to the load L_2. The remaining five kilowatts needed for the ten-kilowatt load of L_2 comes from the generator G_3. None of the electric energy will flow from the generator G_3 to the load L_1. It will all be consumed within load L_2.

The Commission has made considerable reference to the fact that the generators in systems that have electrical connections between them are operated in synchronous operation (or "parallel operation"), meaning that the generators in the various systems all run at a speed which will give the same frequency. This is not something that must be sought —it cannot be avoided when systems have an interconnection. It is simply an electromechanical phenomenon inherently resulting from an interconnection of one electrical system with another. The mere existence of the connection

gives this result. Thus, in the diagram above, all the generators will naturally turn at the same speed.[4]

References to the "free-flowing" nature of electric energy may be misleading if not understood. Electric energy in a circuit is free-flowing in that it changes magnitude or direction in response to variations in loads or generator output, but it does *not* mean that in a given section of transmission line electric energy from one generator flows in one direction and simultaneously electric energy from another generator flows in another direction, or that the electric energy from any given generator can flow beyond the nearest load of size to consume the output of the generator. Referring back to the previous diagram, the free-flowing nature of electric energy will not permit the output of the generator G_3 to flow past the load L_2 so long as the output of the generator G_3 is less than the load L_2.[5]

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[4] App. 38, 39. We do not understand that the Commission denies that synchronous operation inherently results. This result is well recognized in various textbooks such as Langsdorf, *Theory of Alternating Current Machinery*, p. 519 (McGraw-Hill Book Company, Inc. 1955); Puchstein, Lloyd & Conrad, *Alternating Current Machines*, p. 536 (John Wiley & sons, Inc., New York, 1960).

[5] Other terms used by the court below or the Commission should be explained.

"Tie line" is simply the transmission line connecting two or more power systems. Comm. Ex. 29, App. 352. It is not anything that extends beyond a utility's system.

"Tie line control" means the control over the direction and magnitude of flow of electric energy in the Tie lines between a system and the adjacent systems to which its tie lines connect. This is usually done automatically in response to signals received from a telemetering (sensing) system which senses the magnitude and direction of electric energy flow in the tie lines and transmits that information to that particular company's electrical dispatch center.

"Tie line bias control" (sometimes erroneously called "tie line frequency control") is the frequency bias that is automatically set into the tie line control. "Frequency bias" means the amount of extra electric energy that a system is expected to supply to maintain frequency at 60 cycles during the time the load from a neighboring system tends to reduce generator speed.

C. The Florida Operating Committee

The facilities of all five participants of this Committee are wholly located within the state. However, one of the members, Florida Power Corporation ("Corp"), has connections at the Florida-Georgia state line with Georgia Power Company ("Georgia Power") located in that state with whom Corp buys and sells electric energy as part of its regular business.

The Florida Operating Committee interchanges energy among themselves for a limited purpose, as stated by the Examiner:

> The purpose of the energy interchanges is to take care of temporary needs. There are no economy sales (sales by a company that can produce lower cost power to a higher cost producer) because fuel costs are similar for all members. (App. 258).[6]

That is, the connections among the members of the Operating Committee do not exist so that these utilities may assist each other in meeting the anticipated load requirements, but only emergency or temporary needs. As noted by the Examiner, FPL's generating capacity is adequate to supply its own loads and was installed for that purpose. (App. 257).

This means that the Florida Operating Committee is not a "power pool", as the court below so stated (App. 371) and as the Commission recognizes in its Brief (Comm. Brief, p. 5, fn. 2).

FPL has no exchange arrangements with any electric system except the other four members of the Operating

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[6] Since all of the findings of fact made by the Presiding Examiner were approved by the Commission, no effort will be made here to distinguish between findings of the Examiner and findings of the Commission.

Committee. No company outside of Florida is obligated to supply any of FPL's needs—either emergency or normal. FPL is not obligated to serve any electric utility other than those four Florida systems with which it is directly connected, and only temporary and emergency needs of those systems, and then only if FPL has the excess power available. (App. 66, 68-71, 73-74).

The Commission's assertion of jurisdiction, and its attempt to prove interstate transmission of electric energy from or to FPL is based on the connection between Corp and Georgia Power. The interconnections between FPL and Corp are not a multitude of exchange points all along the systems of the two companies, but are at only two locations. One of these connections is between Corp's Turner Generating Plant and FPL's Sanford Substation near the town of Sanford, Florida about 180 miles south of the Georgia state line. The other connection is between Corp's Lake Wales Plant and FPL's Brevard Substation located near the town of Cocoa, Florida which is farther south than the Turner-Sanford connection.[7] Both the Commission and FPL offered evidence concerning the existence or not of interstate flows of electric energy at the Turner-Sanford connection, but none was offered with respect to the Lake Wales-Brevard connection. The Court of Appeals held there was no substantial evidence of any interstate transmission of electric energy through or over the facilities of FPL.

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[7] At one time, there existed a connection between Corp's Jasper Substation and FPL's Live Oak tap in the vicinity of White Springs, Florida. This was dismantled by removing a section of the line prior to commencement of hearings before the Examiner and is not involved in this case. R. 83. It was dismantled for engineering reasons discussed in the record. R. 225.

D. The Interconnected Systems Group

The Interconnected Systems Group ("ISG") described in the Commission's brief is a voluntary group of various electrical systems. (App. 37). FPL has no firm power contracts with it or any of its members to buy or sell electric energy. (App. 66). The ISG is not a power pool, and we do not understand the Commission to so contend.[8] FPL is a member of ISG simply because FPL is connected with Corp, and Corp in turn is connected with Georgia Power.

The Commission gives a quite erroneous impression when it describes the situation within the ISG as "All the electric energy produced by all of the generators of the members of ISG (or any interconnected network) is delivered to a common, integrated transmission grid of the network from which all the network's customers are served." (Comm. Brief, p. 8). This statement of the Commission is literally true if it is realized that what the Commission means is that the total amount of electric energy produced equals the total load. (App. 269). However, as the statement is worded, it might lead one to believe that there is a pool or reservoir of commingled electric energy into which all connected loads dip, or that all loads receive electric energy from all generators. Neither of these impressions is correct. With respect to the first, there is no way of storing electric energy, as the Commission admits. (Com. Brief, p. 8). With respect to the second, every load on an interconnected system cannot be supplied from all generators connected to that system.[9] Each generator (or plant with

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[8] Some of the systems within the ISG are parts of local or regional power pools, but the ISG itself is not a power pool.

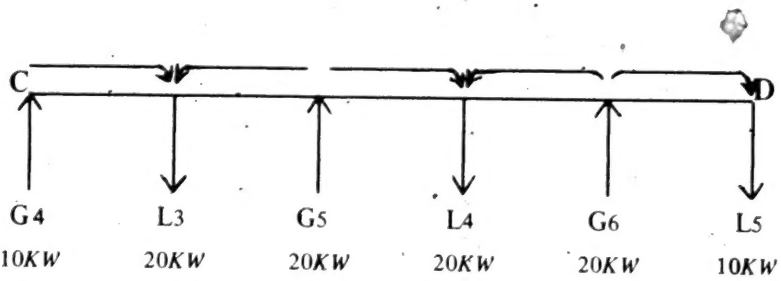
[9] As the Examiner pointed out, the distribution of electric energy in an electric network is determined by, among other things, the location and power outputs of the generating units in operation and the location and size of the electric loads. (App. 266).

several generators) will supply only the load in an area radiating outwardly from it. (R. 247). Electric energy from a generator cannot get past a load which is large enough to consume it.

Thus, a housewife turning on an electric light in Bismark, North Dakota, might have some theoretical effect upon a generator in FPL's system, but certainly no electric energy flows from a FPL generator to that housewife's lightbulb, and we do not understand the Commission to contend that it does. What occurs is what has been described rather accurately by the Examiner as "swapping and redistribution of loads" (App. 265) — a condition that occurs with all the various changes of load and generation size. This is the "cause and effect relationship" to which the Examiner referred. (App. 271).

The "effect" on a generator in FPL's system would exist because the total load on the ISG was changed, and at any time that total load changes there must be a change in total power generated from the whole system to keep generation and load in balance. However, whatever infinitesimal amount of extra energy that was necessary to be developed by the FPL generator would be consumed by the nearest load to that generator to which some other

generator had previously contributed electric energy. This is because of the "swapping" referred to by the Examiner. It is illustrated by the diagram below.



In the diagram, the line C-D is a transmission line and the arrows show the direction of flow of electric energy. If the load L_5 is increased, such as by turning on a light bulb, the additional energy that is required will be supplied by increased generation from the generator G_6 and from some of the electric energy that was going to L_4 from the generator G_6. This small amount of electric energy taken from L_4 will be "swapped" for more electric energy from the generator G_5. This in turn will reduce somewhat the energy supplied to load L_3 by the generator G_5 which will require the output of the generators G_4 and G_5 to increase somewhat to take on this swapped load.

E. The Electromagnetic Unity Theory

The theory upon which the Commission based its conclusion of jurisdictional transmission of electric energy over the facilities of FPL—"Electromagnetic unity"—does not involve any attempt to trace any interstate flow of electric energy into or out of FPL's system. Based on this theory,

the Examiner held, in a finding adopted by the Commission:

> ". . . that [FPL] transmits interstate electric energy. The conclusion is based on cause and effect relationships that are interstate in scope. No effort is made to trace the path of the interstate electric energy." (App. 271).

The effects described by the Commission in its brief—clocks keeping the same time, changes in loads affecting generation, etc.—are caused solely by the mere fact that systems are connected together and *is not caused by the interstate transmission of any electric energy.*

The Court of Appeals held that, standing alone, interconnection with electromagnetic unity is not substantial evidence of transmission of electric energy in interstate commerce over the facilities of FPL. (App. 364).

F. Tracing of Electric Energy

The alternative theory of proof submitted by the staff of the Commission involved attempting to trace electric energy flow to establish an actual transmission of electric energy in interstate commerce to or from FPL's facilities.

Studies of numerous days of electric energy flow were made by the staff in an attempt to show an interstate flow of electric energy, through the facilities of Corp and into the facilities of FPL at the Turner bus, which is owned by Corp and located at the interconnection between Corp and FPL in Sanford, Florida, some 180 miles south of the Georgia state line. The staff also attempted to establish a flow in the opposite direction from FPL's facilities, through the Turner bus, up through the various facilities of Corp and into the State of Georgia.

In its tracing studies, the Commission staff used the "commingled" method of tracing and FPL used the systems study method. The Examiner found:

> "On the basis of the commingled method, it can be proved that electric energy is transmitted between Florida [FPL] and Georgia [Georgia Power]; on the basis of the systems study method the contrary follows." (App. 272).

The difference between these studies thus becomes important.

The principal difference between the two methods involves the treatment of a bus. A bus is a set of three conductors used to electrically connect two or more sets of three lines. The lines may be either receiving electric energy from or transmitting electric energy through the bus. Most of the testimony related to the Turner bus which is essentially a heavy transmission line some 225 feet in length. At certain physically spaced points, which points are also distinct from the points at which electric energy is received, there are connections with lines which take electric energy from the bus and conduct it to various loads. (App. 94; R. 787A). For the Court's convenience, a simple diagram of the Turner bus taken from Exhibits 47 and 56 (App. 231; R. 1249) appears as an attachment hereto, Exhibit B. There are also various buses belonging to Corp between the Turner bus and the Georgia state line through which buses electric energy must flow if it is to go between the State of Georgia and FPL's system.

FPL treated these buses as simply short pieces of transmission line, which they are, and showed that because of the location of the various points of supply and loads on the buses, no electric energy reaching the Turner bus from out of state (if any did) would reach FPL's system because it would all be consumed by Corp's loads connected to

the Turner bus before it reached FPL's system. (App. 86, 87, 231). Likewise, it showed that electric energy from FPL reaching the Turner bus could not pass to Corp's one connection that might possibly lead out of state because it would also all be consumed by Corp's wholly intrastate loads connected to the Turner bus before it reached the possible interstate connection of Corp. (App. 90, 91, 92, 236, 237).[10]

To overcome their difficulty with the actual flow of energy, the staff chose to use the "commingled-in-a-bus" method which blithely ignores the reality that buses have considerable length and that connections are physically spaced along them. This "commingled-in-a-bus" theory treats a bus as simply a point with all connections into and out of the bus being at that point. Having done this, the Commission could then conclude that no matter where electric energy comes from that reaches this theoretically assumed point, some of it will go to each load connected to that bus.[11]

The Court of Appeals did not reverse this case simply because it preferred the tracing method of FPL to the "commingled-in-a-bus" method; it was not choosing between opposing but equally acceptable theories. The court below determined that the Commission had not met its burden of proving actual interstate transmission of electric energy when all it offered was a theory which has never been verified experimentally as fact (App.

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[10] The Commission brief, p. 6, refers to certain interstate flows between Corp and Georgia Power. These are quite insignificant compared to Corp's 4,715,973,800 kilowatt-hours generated by it during the same period of time. R. 1789.

[11] While the use or not of the commingled-in-a-bus method of tracing is of considerable importance in this case, in some situations the choice is irrelevant. For example, if all the generator connections are at one end of a bus and all the load connections are at the other end, then the electric energy flows in only one direction through the bus and the results of tracing are the same whether the systems study method or the commingled-in-a-bus method is used.

95), has never been approved by any court and is only "a simplified characterization of how, for various purposes of convenience, energy may be treated as flowing." (App. 368).

SUMMARY OF ARGUMENT

There must be transmission of electric energy in interstate commerce over FPL's facilities for FPL to be subject to the jurisdiction of the Commission. The Court of Appeals concluded that there was no substantial evidence to show certain or even probable transmission of electric energy across a state line to or from FPL. This conclusion is well supported by reason, principle and legal precedent.

The four Supreme Court cases[12] which have heretofore passed on the jurisdiction of the Commission over utilities under Part II of the Federal Power Act establish (a) a consistent requirement of proof of actual transmission across a state line and (b) an acceptable method of demonstrating such proof which involves measurement of energy flows.

It has been expressly held by this Court that interconnection at a bus with others across a state line does not *ipso facto* mean interstate transmission occurs.[13] It is not enough that certain "cause-and-effect" characteristics of interconnection may support a conclusion that interstate commerce is *affected* by interconnection, nor it is sufficient to say that interconnection *involves* interstate transmission. *Jersey Central* says clearly that beyond mere interconnec-

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[12] *Jersey Central Power & Light Co.* v. *FPC*, 319 U.S. 61 (1943) ("Jersey Central"); *Connecticut Light & Power Co.* v. *FPC*, 324 U.S. 515 (1945) ("Connecticut"); *Pennsylvania Water & Power Co.* v. FPC, 343 U.S. 414 (1952) ("Penn-Water"); *FPC* v. *Southern California Edison Co.*, 376 U.S. 205 (1964) ("City of Colton").

[13] *Jersey Central*, 319 U.S. at 65-66.

tion, there must be a showing of measurable electric energy flowing across state lines to or from the company sought to be regulated.

In order for the Commission's evidence in this case to be deemed sufficient and substantial proof of interstate transmission of electric energy, this Court must squarely overrule *Jersey Central.*

The Commission in its presentation emphasizes the complexities of the subject matter in an attempt to persuade the Court that the expertise of the Commission—regardless of the basis of its theories in this particular case—is inviolable. The subject matter is not so complex that the Commission—in the name of "expertise"—is entitled to ignore the statutory standard and substitute theoretical constructs for proof of interstate transmission of electric energy. Elevating a descriptive phrase like "electromagnetic unity of response" to a *theory of possible energy flow* does not prove the occurrence of the jurisdictional event.

As an alternative to its "electromagnetic unity" theory, the Commission attempted to trace flows of electric energy, but its "commingled-in-a-bus" method of tracing was disapproved in principle by this Court in *Jersey Central*, and its reason for existence was strongly rejected by the Commission itself in the *Connecticut* case.[14] The Examiner found that the method of measuring and tracing energy flow which was the basis for the decisions in *Jersey Central* and *City of Colton* cases, when applied to the present case, showed no interstate transmission of electric energy over the facilities of FPL.

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[14] *Connecticut Light & Power Co.*, 3 F.P.C. 132, 145 (1942); *Connecticut Light & Power Co.* v. *FPC*, 141 F.2d 14, 18 (D.C. Cir. 1944).

The Commission places some reliance on *Penn-Water*. In that case the Commission apparently used a "commingled" theory to establish interstate flows, but under the particular facts of the case the finding of interstate flows of energy would in all likelihood have been the result under the *Jersey Central* tracing method as well. In the *Penn-Water* case interstate transmission was not really contested, and the Court ruled against the utility primarily on the grounds that there were seasonal occurrences when every part of the utility's system was served for some period of time by such out-of-state electric energy.

The "commingled-in-a-bus" method of tracing was apparently not used in the "power pool" cases.[15] In those Court of Appeals cases the Commission made substantial efforts to prove large amounts of interstate electric energy in the particular "public utility's" system and in some situations showed by tracing that some if not all wholesale sales at some time received out-of-state energy. Under the particular facts of these cases — *and in the absence of any tracing evidence to the contrary* — jurisdiction over all such sales was held to be established by substantial evidence.

However, no such circumstances were shown here. Any inferences which might be otherwise justifiable based on the Corp-Georgia Power electric energy transmissions were rebutted by the evidence of actual tracing.

Based on the foregoing, FPL submits the Court of Appeals reached the correct conclusion.

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[15] *Indiana & Michigan Electric Co.* v. *FPC*, 365 F.2d 180 (7th Cir.), cert. denied, 385 U.S. 972 (1966); *Arkansas Power & Light Co.* v. *FPC*, 368 F.2d 376 (8th Cir. 1966); *Public Service Co. of Indiana* v. *FPC*, 375 F.2d 100 (7th Cir.), cert. denied, 387 U.S. 931 (1967); *Cincinnati Gas & Electric Co.* v. *FPC*, 376 F.2d 506 (6th Cir.), cert. denied, 389 U.S. 842 (1967).

No compelling reasons exist why FPL must now be subjected to the jurisdiction of the Commission. The connection between Corp and FPL upon which the Commision asserts jurisdiction has existed since 1942. When the connection was ordered as a wartime emergency measure, *the Commission informed FPL by letter (R. 202) that the interconnection "will not in and of itself bring Florida Power & Light Company within the jurisdiction of the Federal Power Commission."* This remained the Commission's position until 1965. No material fact or pertinent law has changed.

The court below stated the essence of what the Commission seeks as follows:

> "What the Commission virtually argues for in this case is extension of its jurisdiction to all electric companies *affecting* interstate commerce."

This is far in excess of the grounds for jurisdiction listed in Part II of the Federal Power Act.

FPL is essentially a distribution company dedicated to serving Florida consumers. It is independently fulfilling its responsibilities. Virtually all its sales are to the ultimate consumer at rates regulated by the Florida Public Service Commission. If there is a national interest which requires federal regulation of FPL, it is for Congress to declare such a policy, for none can be found in the Federal Power Act as presently enacted.

ARGUMENT

I. INTRODUCTION

The Court of Appeals found that the Commission had not met its burden of proving transmissions of electric energy in interstate commerce over the facilities of FPL.

The Commission urges that, as applied by the court below, the standard for proof of these facts is too difficult.

It says it is "unsatisfactory" to require it to "convince a court of scientific laymen that, in common-sense terms, some identifiable thing moves across states lines." Further it says, in effect admitting it did not prove actual transmissions by substantial evidence, that

> "It is not enough to say that the Commission must abstain until such time — if ever — as it can be proven as a 'fact' in common law terms that there is an 'actual' transmission."[16]

Yet the standard of which the Commission complains is simply the *statutory* burden — and limitation — placed on the Commission by Congress at a time when there existed the same technological problems, complexity of subject matter, and lay judges which the Commission today laments. As announced by this Court in the cases discussed hereafter, "transmission of electric energy in interstate commerce" means *actual* transmission across a state line.

Rather than resting its jurisdiction on "transmissions in interstate commerce," the Commission asserts for the first time that it can claim jurisdiction simply because FPL has transmissions *affecting* or *involving* interstate commerce. This position, although couched in technical-sounding language, is nevertheless contrary to the statute and the legislative history which plainly indicates Congress did not with this Act intend to regulate to the full extent of its powers under the Commerce Clause. U. S. Constitution, Article I, Section 8, Clause 3.

Congress apparently did not feel that there is something wrong with requiring an administrative agency to restrain its hand until it *proves* it is entitled to assert regulatory control, or that jurisdictional facts represent a mere technicality which may be cursorily treated. Quite apart from the limitations inherent in the state-federal relation-

[16] Comm. Brief, p. 36.

ship, the jurisdictional facts define the extent of the need as seen by Congress for federal regulation.

Finally, it should be pointed out that, although the Commission complains that the Fifth Circuit here substituted its judgment for that of the Commission, the opinion of the court below establishes clearly that the evidence in this case simply failed to come up to the statutory standard. Under these circumstances the court below was not required to blindfuly accept the Commission's conclusions in the name of "expertise."

II. THE EXISTING STANDARDS FOR DETERMINING INTERSTATE FLOW SHOW NO JURISDICTIONAL TRANSMISSION FROM OR TO FPL

As the court below points out, Part II of the Federal Power Act was enacted in 1935 in order to close the regulatory gap pointed out by this Court in *Public Utilities Commission of Rhode Island* v. *Attleboro Steam & Electric Co.*, 273 U.S. 83 (1927). Jurisdiction of the Commission under this Act has been considered by this Court on four occasions, two involving claims of jurisdiction based on interstate transmission of electric energy and two based on wholesale sales in interstate commerce.

These cases present the basic standard for determining Commission jurisdiction: actual interstate transmission of electric energy as demonstrated by measurement of such transmission.

The first and most important in terms of precedent for the present case is *Jersey Central Power & Light Co.* v. *FPC*, 319 U.S. 61 (1943). Here the company (Jersey Central) which the Commission asserted was a "public utility" was connected to an admittedly jurisdictional company (Public Service) by a two-mile line from Jersey

Central's South Amboy, New Jersey generating plant to a bus at Public Service's Mechanic Street Substation. The facilities of both these companies were located wholly within New Jersey. As described in the lower court opinion[17] the bus had seven connections in addition to the Jersey Central line. Five were to customers of Public Service in New Jersey, one to a Public Service substation in New Jersey, and the seventh was a line of a New York company (Staten Island).

Jersey Central and Public Service exchanged economy-flow electric energy,[18] as well as emergency energy. However, the quantity Jersey Central transmitted to Public Service far exceeded the deliveries returned. Public Service also had exchange agreements for economy-flow with Staten Island. All energy involved was transmitted in three-phase alternating current.

This Court held that since the bus had several connections and received energy from sources other than Jersey Central, the connection of the bus with Staten Island together with emergency transfers of electricity did "not prove conclusively that energy generated by Jersey Central passes to and is consumed in New York." (319 U.S. at 65).

This Court also carefully pointed out:

> ". . . Commission power does not extend over all connecting transmitting facilities but only over those

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[17] *Jersey Central Power & Light Co.* v. *FPC*, 129 F.2d 183, 186 (3rd Cir. 1942).

[18] "Economy-flow electricity may be described as energy generated and supplied by one company to another when the receiving company has enough generating facilities to generate that electricity for itself but elects to receive it from another company because that company can generate and deliver it to the point where it is needed more cheaply than the purchasing corporation." Ibid, 129 F.2d at 186.

> which transmit energy actually moving in interstate commerce. *Mere connection determines nothing.*" (319 U.S. at 72).

However, the Commission demonstrated actual interstate transmission by showing numerous instances based on *meter readings,*

> ". . . when *all* the energy flowing into the bus bar at Mechanic Street came from Jersey Central and at the same moments energy flowed from Mechanic Street in New Jersey to the Atlantic substation in New York. As no pools of energy exist from which the flow to New York could have been drawn, it necessarily follows that Jersey Central production was instantaneously transmited to New York." 319 U.S. at 66.

This Court held that this *actual* interstate transmission as measured and traced established the jurisdictional authority over Jersey Central.

Applying the principles of that case to FPL, Corp and Georgia Power, it is easy to see that the Commission has proved only the bare fact that both FPL and Georgia Power have connections with Corp — but not the same connection. At the Turner bus, where FPL connects with Corp, no evidence was forthcoming of even one occasion when electric energy from Georgia Power ever came through Corp's system and then went to FPL's connection on the Turner bus.

To the contrary, using the same method of measurement and tracing employed and approved in *Jersey Central,* FPL's witnesses showed and the Examiner agreed that there was no interstate flow into or out of FPL's system. On the occasions considered by the Commission to prove its case, all FPL energy transmitted to Corp was consumed by Corp's loads before it *could* have reached a line

carrying energy to Georgia Power and all energy received by Corp from Georgia Power would likewise have been consumed in the Corp system before it *could* have reached FPL's line to the Turner bus, 180 miles away from the Georgia-Florida state line where all energy transfers between Corp and Georgia Power take place.[19]

The other transmission status case of this Court is *Connecticut Light & Power Co.* v. *FPC*, 324 U.S. 515 (1945), where as reviewed by this Court there was no real dispute that there were interstate flows. As pointed out by the lower court,

> "Since actual meter readings in this case show such an interstate flow of current to supply petitioner's facilities, it is a public utility under the Act."[20]

This Court there said that under the Act,

> "Federal jurisdiction was to follow the flow of electrical energy, an engineering and scientific, rather than a legalistic or governmental test." 324 U.S. at 529.

Applying the *Connecticut* case to the evidence offered by the Commission in this case the court below in the present case could find no basis for supporting the conclusion that FPL was a "public utility."

In the first jurisdictional case of this Court based on sales at wholesale, *Pennsylvania Water & Power Co.* v. *FPC*, 343 U.S. 414 (1952), the company did not dispute that electric energy flowed back and forth across the Pennsylvania-Maryland state line, nor that some of its sales at wholesale in both states were made with such energy. The company denied that its "sales to its Pennsylvania customers can be considered sales in interstate commerce because each in-

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[19] App. 272.

[20] *Connecticut Light & Power Co.* v. *FPC*, 141 F.2d 14, 18 (D.C. Ct. App. 1944).

cludes varying amounts of energy which does not cross the state line."[21]

This Court held that because the wholesale customers received at least some out-of-state energy, those sales were subject to the jurisdiction of the Commission.

Jurisdiction of the Commission under Part II of the Act was most recently reviewed by this Court in the *City of Colton* case, *Federal Power Commission* v. *Southern California Edison Co.*, 376 U.S. 205 (1964). In that case, substantial quantities of power generated in Nevada and Arizona were sold to Edison, and transported into California. The Commission traced this energy through Edison's Hayfield and Highgrove Substations, the latter of which supplied all the requirements of the City of Colton. Edison was already being regulated as a "public utility" by the Commission, and the only question was jurisdictional status of this sale. The Court of Appeals assumed the sufficiency of evidence of interstate energy being used in making the sale to the City of Colton at wholesale, but denied the Commission's jurisdiction over that sale because there was no substantial interstate effect.

In this context this Court declared that there was substantial evidence of interstate energy flowing to the City of Colton and that the Congressional intent was for *all* sales at wholesale of interstate energy to be subject to Commission jurisdiction, regardless of the degree of impact on interstate commerce. 376 U.S. at 215-216.

The very same method of tracing relied upon by the Commission and this Court to establish the flow of interstate energy to the City of Colton, when applied to FPL, Corp and Georgia conclusively shows that no interstate energy was transmitted over FPL's facilities.

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[21] *Pennsylvania Water & Power Co.*, 8 F.P.C. 1, 12 (1949).

Rather than the foregoing cases, the Commission attempts to rely upon the methodology of Court of Appeals decisions, the "power pool" cases. *Indiana & Michigan Electric Co.* v. *FPC*, 365 F.2d 180 (7th Cir.), cert. denied, 385 U.S. 972 (1966); *Arkansas Power & Light Co.* v. *FPC*, 368 F.2d 376 (8th Cir. 1966); *Public Service Co. of Indiana* v. *FPC*, 375 F.2d 100 (7th Cir.), cert. denied, 387 U.S. 931 (1967); and *Cincinnati Gas & Electric Co.* v. *FPC*, 376 F.2d 506 (6th Cir.), cert. denied, 389 U.S. 842 (1967).

Each of the companies involved in the above cases was an admitted "public utility" within the meaning of the Act. Each made numerous jurisdictional sales at wholesale. The only question in each case was whether other, particular sales were also subject to Commission regulation. The court in each case held such sales were jurisdictional.

In *Indiana & Michigan*, no tracing studies were offered, but the Commission did show that such large amounts of interstate energy were present at numerous locations throughout the utility's system that the only reasonable conclusion was that such energy at least on some occasions was used in making the sales in question.[22] In *Arkansas*[23] and *Public Service*[24] tracing studies that were made confirmed the high degree of probability of interstate energy going to *all* sales. In *Cincinnati Gas & Electric* the court's opinion does not refer to tracing, but in a Commissioner's concurring opinion, it is noted that the staff presented a comprehensive tracing study which showed that out-of-state energy reached every point of resale.[25]

In any event there was no tracing testimony to rebut any inference that interstate energy was transmitted in

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[22] 365 F.2d at 182, 183.
[23] 368 F.2d at 380.
[24] 375 F.2d at 104, fn. 8.
[25] *Cincinnati Gas & Electric Co.*, 35 F.P.C. 99, 104 (1966).

each sale. In each of these cases, jurisdiction over those sales was established under the facts. It cannot be said that these cases or any of them laid down a general principle that jurisdiction over all sales at wholesale would be proved simply by showing that the public utility in question received some interstate electric energy.

The court below pointed out in great detail the inapplicability of these cases to the FPL situation.[26] Here there is no justification for the Commission to make the *inference* that FPL is a "public utility," where the evidence of tracing shows no actual transmissions of interstate energy over any facilities of FPL, and therefore completely rebuts any inference which might otherwise be made based on the Corp-Georgia Power connection.

III. THE ELECTROMAGENTIC UNITY THEORY IS NOT EQUIVALENT TO INTERSTATE TRANSMISSION AND IS NOT SUBSTANTIAL EVIDENCE THEREOF

The Commission argues that interconnection between companies (such as all those in the ISG) produces a certain phenomenon, which it labels "electromagnetic unity of response", that such a phenomenon involves a cause in one state and an effect in another, and therefore the "theory of electromagnetic unity of response" *is* "transmission of electric energy in interstate commerce."

This approach is contrary to the existing standards heretofore applied.

First and foremost, the Commission's theory is not compatible with the statute. Congress defined interstate transmission as follows:

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[26] App. 368-371, as reproduced in Exhibit "A" hereto.

> "[E]lectric energy shall be held to be transmitted in interstate commerce if transmitted from a State and consumed at any point outside thereof." Section 201(c), 17 U.S.C. § 824(c).

In its previous encounters with the jurisdictional status of companies under this statute, this Court has in every case looked to proof of *actual* transmissions. *Jersey Central,* 319 U.S. at 64-67; *Connecticut Light & Power Co.,* 324 U.S. at 518-521; *Penn-Water,* 343 U.S. at 419-420; and *City of Colton,* 376 U.S. at 208-209.[27]

As pointed out above, "electromagnetic unity" is a cause-and-effect phenomenon related to interconnection; it does not mean that transmission takes place between the location of a cause (a light being turned on in Georgia) and the location of a possible effect (FPL generator site). Nothing in this phenomenon would give an "engineering and scientific" basis for inferring interstate transmission of electric energy.[28]

The Commission speaks broadly about the Interconnected Systems Group (ISG). However, the record does not offer much beyond the cause-and-effect relationship resulting from synchronism. In terms of the validity of the theory of "electromagnetic unity" as a substitute for actual transmission, the ISG is irrelevant. The simple fact of Corp's

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[27] Reference is made to the Court of Appeals decision in each case for further facts showing measurement of actual transmissions of electric energy in interstate commerce.

[28] The Commission in its brief, page 25, says there must be some sort of "signal" being "transmitted" when a generator in one state alters its mode of operation by reason of the addition of a load in another state. The Commission does not give record reference for this statement, which is understandable, since we know of no testimony about any such "signal" or that if it exists it constitutes the transmission of *electric energy.* The only "signal" involved is the response of the generator to the load it supplies, and all the generators of FPL supply only loads in Florida.

connections with both Georgia Power and FPL either establishes jurisdiction or, as FPL contends, it is insufficient to do so.

The record is clear that by interconnecting with Corp which is in the ISG, FPL is not thereby a part of an "integrated, interstate pool operation",[29] nor can its actual status be stretched by such words as "interdependent with and upon the ISG." FPL is basically autonomous and independent in generating enough electric energy to meet all its own loads. The "substantial benefits" claimed by the Commission[30] to accrue to FPL with membership in the ISG are substantially hypothetical.

The Commission says FPL "receives automatic assistance during emergencies, including assistance from the non-Florida ISG utilities up to the 100 megawatt capacity of the Corp-Georgia [Power] tie line".[31] This gives the completely erroneous impression that FPL *in fact* receives or has received any electric energy from the ISG. The record does not disclose any instance when FPL has ever received electric energy — emergency or otherwise — from any company outside the State of Florida.

The Commission's brief (p. 7) suggests that because of its membership in the ISG, FPL *transmitted* 8 megawatts of electric energy to a Midwestern utility when the latter suffered a loss of generation on February 17, 1965. The staff did not attempt to trace this electric energy out of state, and a witness who testified about this stated unequivocally that FPL simply had a *scheduled* net interchange with members of the Florida Operating Committee of 8 megawatts immediately following the outage in the Midwest and "by no stretch of anyone's imagination, could [the 8 megawatts] be considered to have crossed the state line let alone travel all the way to the Midwest."[32]

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[29] *Arkansas Power & Light*, supra, 368 F.2d at 379.
[30] Comm. Brief, pp. 11, 26, 30.
[31] Comm. Brief, p. 11.
[32] App. 73, 75.

The existence of the ISG, the connection of FPL to Corp, and the connection of Corp to Georgia Power makes possible energy transmissions different from those which are now occurring or which have occurred. But the mere possibility that FPL might change its operations at some future time to transmit or receive out-of-state energy over its facilities cannot be the basis for the Commission to assert its jurisdiction at the present time. The Commission's jurisdiction must be based on actual interstate transmissions, not the possibility of future interstate transmissions.

As a theory of jurisdiction, "electromagnetic unity" is a construct applied for the first time in this case. None of the Supreme Court cases above use the term, nor do the power pool cases. The latter merely mention the fact that generators within the pool are "interlocked electromagnetically,"[33] or that "frequency control" of generators is involved,[34] or that the power pool members operate "in synchronism,"[35] but jurisdiction was not found to attach simply because of any such thing as "electromagnetic unity."

The Commission admits "FPL's participation in the Florida Operating Committee and the ISG lacks the scope of the pooling arrangements" in the power pool cases.[36]

In the *Jersey Central* case, the Commission attempted to make something out of the fact that Jersey Central was interconnected and "synchronized" not only with two other New Jersey companies but also "other electrical transmission systems covering the southern part of New Jersey, the southeastern part of Pennsylvania, the northeastern

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[33] *Indiana & Michigan*, supra, 365 F.2d at 183.
[34] *Arkansas Power & Light*, supra, 368 F.2d at 378.
[35] *Cincinnati Gas & Electric*, supra, 376 F.2d at 507.
[36] Comm. Brief, p. 30.

part of Maryland, Delaware and with the Staten Island Company . . ." To this, the Third Circuit responded:

> "Though much emphasis is laid by some of the Commission's witnesses on the phenomenon of synchronization, it does not possess significance under the facts of the appeals at bar except to the extent indicated in the opinion."[37]

On appeal, this Court had before it the same evidence when it affirmed the Third Circuit and said, "Mere connection determines nothing."

Thus, what the Commission now calls a new "theory" of interstate transmission is the same thing urged and rejected in 1943. The same technology with respect to this fact existed then as now. No reason appears why *Jersey Central* should be overruled or why the definition of what constitutes interstate transmission should be changed for the sole purpose of bringing FPL for the first time in 36 years under Commission jurisdiction.

The Commission's plea that it should be allowed to apply its own "scientific" definition of *transmission of electric energy*,[38] is a bald attempt to put itself beyond the restraining guidance of judicial review. Similarly, its argument about the impracticability of tracing in this case, citing the power pool cases,[39] is tantamount to confessing inability to *prove* interstate transmission.

By urging the many unexplained characteristics of electricity, the Commission is asking for the right to determine its jurisdiction over electric companies wholly outside the limits established by Congress in Section 201 of the Federal Power Act.

Similarly, the Commission's argument from the *City of Colton*[40] case points up the extent to which its claim of

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[37] 129 F.2d at 187
[38] Comm. Brief, p. 37.
[39] Comm. Brief, p. 28.
[40] Ibid. p. 31.

jurisdiction over FPL is beyond that statute. The "bright line" said by this Court to have been drawn by Congress between state and federal jurisdiction over sales at wholesale[41] has no application to the matter of *determining whether or not there has been interstate commerce.*

Assuming interstate transmission, there is no distinction made between those sales at wholesale which have substantial impact on interstate commerce and those which do not. The Commission has no discretion to decline to exercise jurisdiction over those in the later category. This was the holding in *City of Colton*. Nothing was said to indicate that the interstate character of transmissions could be established by any generality such as "interconnection" or "electromagnetic unity."

Indeed, this Court there recognized the differences between a case where interstate transmission was admitted, and one where this was yet to be established, pointing out that the Commission had initial discretion to decline jurisdiction altogether over a company whose interstate transmissions, if any, were *de minimis*, particularly where no jurisdictional sales at wholesale were involved.[42]

As discussed above, the *City of Colton* case established interstate transmissions by the same method stated by the Examiner to show no interstate transmissions in this case.[43] The standard of proof in that case as well as in *Jersey Central* was *actual* transmissions. The same standard should apply here.

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[41] 376 U.S. 215-216.

[42] 376 U.S. at 209, n. 5.

[43] App. 272.

IV. THE TRACING STUDY SUBMITTED BY THE COMMISSION DOES NOT ESTABLISH BY SUBSTANTIAL EVIDENCE INTERSTATE TRANSMISSION FROM OR TO FPL

The Commission suggests that there are three kinds of situations with three rules to be followed in ascertaining jurisdictional transmissions: the *Jersey Central* case, where "the task of tracing has been simple due to the limited number of interconnections involved," the power pool cases where no tracing is practicable, and then a middle category where tracing is "possible" but so involved that a different method must be used.[44]

The Commission says this case falls in the latter category — even though like *Jersey Central,* we are concerned with only one place of connection between FPL and Corp.

The Commission's idea of a different method is simply one that produces the desired result. It is an overstatement to say that this Court approved the "commingled-in-a-bus" theory in the *Penn-Water* case. Nowhere in the Commission or court opinions is the crucial point stated or particularly relied upon that a bus may be treated as a point or a tank or a reservoir. As evident from the discussion of this case above, page 17, the *Jersey Central* method of tracing would undoubtedly have produced the same result.

Similarly, in the other case cited in support of the "commingled-in-a-bus" theory, *Wisconsin-Michigan Power Co.* v. *Federal Power Commission,* 197 F.2d 472 (7th Cir. 1952), cert. denied, 345 U.S. 934 (1953), the presence of Wisconsin energy in the company's Michigan lines, and Michigan energy in that same company's Wisconsin lines was not disputed. Jurisdiction over the sales for resale was contested on grounds other than the correctness of the tracing of interstate electric energy.

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[44] Comm. Brief, p. 32.

This appears to be the first case where the "commingled-in-a-bus" theory produces a different result from the standard method of tracing. There is nothing in the record to indicate that the Commission would not have been perfectly satisfied to use the standard method had it supported a finding that FPL is a jurisdictional "public utility." As the Examiner stated,[45] this standard method proves the contrary—no out-of-state energy was transmitted over FPL's lines during the periods studied.

The Commission calls the "commingled-in-a-bus" theory a refinement,[46] while the dissenting Commissioners point out that this is just a theory, and that its underlying assumptions really beg the question of jurisdictional transmission, obviating the necessity for tracing actual transmissions.[47] The Examiner acknowledged it was only a theory—it has never been proved experimentally as a fact[48] —but concluded it more accurately represents the facts to treat "the bus as a point, a tank or a reservoir."[49]

FPL challenges this assumption of accuracy. The commingled theory assumes the 225-foot Turner bus to be a point, which it is not; or assumes that there can be a tank or reservoir of electricity, which is an impossibility since electricity cannot be stored. The Commission's expert witness admits that his commingled theory does not take into consideration "the physical dimensions, mechanical properties and electrical properties" of a bus.[50] The Commission's theory is thus a legalistic rather than an engineering or scientific one, and the use of such legalistic tests in determining electrical flow was condemned by this Court in

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[45] App. 272.
[46] Comm. Brief, pp. 32-33.
[47] App. 303-304.
[48] App. 95.
[49] App. 274.
[50] App. 164.

Connecticut Light and Power Co. v. *FPC*, 324 U.S. 515 at 529.[51]

It is the ignoring of the physical reality of the Turner bus to which FPL objects. FPL acknowledges that there can be "commingling" of electric energy where the location and connection of generators produces a mixed flow of electric energy in one direction to the load.[52]

However, in order for there to be "commingling" of electric energy within the bus under all circumstances, one must disregard the location of connections along the bus, and the inputs and outflows through those connections and one must postulate a "filling of the tank," with a swirling ebb and flow of electric energy, analagous to the random mixing of molecules of natural gas within a pipeline.

We submit that the Commission's *purpose* for using the "bus-as-a-point" theory is to establish jurisdiction. Its stated *reason* for using such theory was previously given the *coup de grace* by the Commission itself (with judicial approval) in the Commission's decision in the *Connecticut* case.[53] Now the Commission seeks to use that which it completely discredited nearly thirty years ago. We submit it was a wrong theory then, and it is still wrong.

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[51] Just as jurisdiction cannot depend on the ingenuity of attorneys in drafting natural gas contracts which ignore the reality of gas flowing in interstate commerce, *Federal Power Commission* v. *Lo-Vaca Gathering Co.*, 379 U.S. 366 (1964), so jurisdiction here should not depend on the ingenuity of Commission staff experts in devising theories of electric flows which also ignore realities.

[52] This apparently is the way the term "commingling" is used in the "power pool" cases, discussed above (pp. 25-26) where it was used to describe the electric energy in a company's system *after* it has been shown that substantial amounts of interstate energy were transmitted at several places into that company's lines, the "commingling" being with energy from the company's own generators.

[53] *Connecticut Light & Power Co.*, 3 F.P.C. 132 (1942).

The Commission, through its expert, says that it treats a bus as a point because in an alternating current flow (whether it be three-phase or not) there is a small portion of each fraction of a second during which "power" in each phase flows back from the load to the generator. (App. 146, 147, 154, 155). He says that while watt-hour meters may be adequate for most business and operating purposes, they are not adequate here because they do not show the relatively small negative (or reverse) "power" portion of the cycle separately from the positive "power" portion of the cycle. (App. 147, 151, 153, 167-169). The knowledge of the existence of these negative "power" pulses is not new. They were well known before the *Connecticut* case (R. 767-769). As will be shown later herein, *these negative "power" pulses are not electric energy.* But regardless of that, the Commission in the *Connecticut* case rejected an expert witness's theory that "over and above the flow of electric energy on a circuit shown by watt and watt-hour meters there may be postulated other flows and counterflows not shown by the meters," stating that such a theory,

> ". . . is wholly suppositious and not supported by the commercial practice of the electric utility industry. That practice is to accept such meter readings as showing the direction in which electric power or energy is supplied, and the total amount supplied as a basis of payment for energy bought and sold in the countless transactions upon which the industry's revenues depend."[54]

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[54] 3 F.P.C. at 145. Yet in the present case the Commission's witness said: "One way would be to have counter-flows, to show areas of power flow in both directions from each generator, or to treat the — to collapse the bus as a point or call it a tank or a reservoir, so you don't have to concern yourself with the intricacies of what happens on the bus itself. . . . The commingling method accounts for [what happens on the bus] in the form of a basket. In other words, it is all-inclusive; you don't care what happens between the points." App. 150-151.

The Court of Appeals affirmed the Commission and on this point stated:

> "... A distinction between electric current as measured on a meter and electric energy was certainly not within the contemplation of Congress when it passed the Act; indeed, no scientist knows what the nature of electric energy is. Ordinarily meter readings which measure electric current are sufficient data on which to make charges for electricity to users. That they are equally sufficient to determine the interstate transmission of energy under the Federal Power Act is shown by the case of Jersey Central Power & Light Co. v. Federal Power Commission, 1943, 319 U. S. 61, 63 S.Ct. 953, 87 L.Ed. 1258."[55]

On appeal to this Court, the dissent noted that the interstate transmission of electric energy was undisputed.

We submit that the Commission and the Court of Appeals in the *Connecticut* case were correct with respect to flows of electric energy.

The proposition that any one cycle of "power" includes a small portion of a negative or reverse "power" is misleading. The "power" that is supposed to be reversing is not electric energy. (This may be why the concept of reverse flow was rejected in the *Connecticut* case.)

The "power" diagrams used by the Commision's expert in an attempt to establish a small reverse flow of "power" are diagrams of *apparent* power.[56] Apparent power is composed of both *real* power and *reactive* power. Reactive power is that portion of apparent power that *does no work*,

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[55] *Connecticut Light & Power Co.* v. *FPC*, 141 F.2d 14, 17 (D.C. Cir. 1944).

[56] Ex. 58, App. 240; Ex. 59, R. 1252; Ex. 60, R. 1253.

it is not measured in kilowatts but is measured in kilovars, and it is the part of the apparent power curve that shows up as a negative pulse. It is not electric energy as it does no work. However, *real* power is the work-producing part of apparent power and is measured in kilowatts. That is, real power is that part of apparent power which is the electric energy at any one instant.[57]

Real power, that is, instantaneous *electric energy, never has a reverse pulse* and this is admitted by the Commission's expert (App. 174).

The Commission has phrased the question before this Court solely in terms of the interconnection establishing jurisdiction *per se* under the electromagnetic unity theory.[58] Thus, the Commission plainly recognizes its attempt at tracing as a subordinate effort, or as the Commission witness put it, "a rough approximation."[59]

The Commission's brief urges that "the tracing of power flows is an unnecessary and inefficient procedure for deter-

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[57] The terms "apparent power", "reactive power" and "real power", are defined as follows:

"*APPARENT* Apparent power is proportional to the mathematical product of the volts and amperes of a circuit. This product generally is divided by 1,000 and designated in kilovoltamperes (kVA). It is comprised of both real and reactive power."

"*REACTIVE* The portion of 'Apparent Power' *that does no work*. It is commercially measured in kilovars. Reactive power must be supplied to most types of magnetic equipment, such as motors. It is supplied by generators or by electrostatic equipment, such as capacitors."

"*REAL This is the energy or work-producing part of 'Apparent Power.'* It is the rate of supply of energy, measured commercially in kilowatts. *The product of real power and length of time is energy,* measured by watthour meters and expressed in kilowatthours."

Glossary of Electric Utility Terms prepared by the Statistical Committee of the Edison Electric Institute, pp. 62, 63. See footnote 2.

[58] Comm. Brief, p. 2.

[59] App. 49.

mining Commission jurisdiction."[60] But it has never before rejected this universally applied method of determining jurisdiction over a company.

The Commission's "commingled-in-a-bus" theory did not in this case establish substantial evidence of the interstate flow of electric energy, or as the court below put it, the Commission does not meet its burden of proof,

> " . . . by postulating a simplified characterization of how, for various purposes of convenience, energy may be treated as flowing."

The Commission attacks this holding of the court, saying, "the court of appeals has improperly acted on the basis of its own inexpert views."[61]

This appeal seems to be made whenever an administrative agency is reversed. But the court of appeals is required to review both the standard of proof used and the substantial evidence offered. *Federal Power Commission* v. *Sierra Pacific Power Co.*, 350 U.S. 348, 354 (1956).

The court below found the theories and methods used by the Commission did not accord with the standard required by the statute: actual transmission of electric energy in interstate commerce. Where the statutory requirements for establishing the jurisdictional facts were so clearly ignored by the Commission, it cannot expect to be able to hide behind the complexity of the subject or a claim of immunity to investigation of their "expertise."

In analyzing and reviewing the cause in this manner, the court correctly concluded that the statute had not been applied by the Commission to FPL, in the words of *Gray* v.

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[60] Comm Brief, p. 3..

[61] Comm. Brief, p. 37.

Powell, 314 U.S. 402, 411 (1941)[62] "in a just and reasonable manner." Under these circumstances the court was not bound to accept without question the Commission's interpretation of the statute nor the application thereof to the facts of the case. *Volkswagenwerk Aktiengesellschaft* v. *Federal Maritime Commission,* 390 U.S. 261, 272 (1968). This is particularly true where the action taken is so contrary to the principles of prior cases.

Having determined under the evidence as tested by the statute and applicable cases that there is no substantial evidence upon which FPL could be declared to be a "public utility," the court of appeals is entitled to have its decision stand, where, as here, there has been no misapprehension or gross misunderstanding of the evidence. *Universal Camera Corporation* v. *National Labor Relations Board,* 340 U.S. 474, 490-491 (1951).

V. NO REASONS OF PUBLIC IMPORTANCE REQUIRE COMMISSION REGULATION OF FPL

The legislative history of the statute in question is detailed in the *Jersey Central* and *Connecticut* cases. The conclusion is stated in the former case that the primary purpose of Part II of the Federal Power Act

> ". . . was to give a federal agency power to regulate the *sale* of electric energy across state lines."[63]

The Court quoted from *Jersey Central* in *Connecticut:*

> "The purpose of this act was primarily to regulate the rates and charges of the interstate energy. If intervening companies might purchase from producers in the state of production, free of federal control, cost

[62] Cited on this point by the Commission in its brief, p. 37.
[63] 319 U.S. at 67.

would be fixed prior to the incidence of federal regulation and federal rate control would be substantially impaired, if not rendered futile."[64]

FPL does not dispute that interstate *transmission* is made an independent basis for Commission jurisdiction, but clearly it is interstate *sales at wholesale* that is the primary concern, and regulation of interstate transmissions is incidental to and in support of regulation of wholesale rates.

Under these circumstances, where FPL has only six small sales at wholesale, and no evidence was offered that these might be jurisdictional sales, even assuming FPL be declared a "public utility" under the Act, there is slight reason to compel Federal regulation of FPL's facilities based on alleged transmissions that would admittedly be insignificant even under the Commission's theory of the case.

As pointed out previously, FPL is uniquely situated in the peninsula of Florida. Requiring the Commission to adhere to the *Jersey Central* standard in this case will not improperly limit the Commission in the performance of its regulatory duties elsewhere in the country.

The Commission is asking in effect that it be allowed to regulate any electric company which *affects* interstate commerce. This may be a proper objective in the public interest, but Congress has yet to declare it so. If the Commission thinks it needs its jurisdiction expanded over all electric energy in this country, let it plead its case to Congress, not this Court.[65]

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[64] 324 U.S. at 524.

[65] On this subject this Court said in the *Connecticut* case: "Such a broad and undivided base for jurisdiction of the Power Commission ["affecting" interstate commerce] would be quite unobjectionable and perhaps highly salutary if the United States were a unitary government and the only conflicting interests to

Because the court below found there was no substantial evidence of interstate transmissions, it did not directly pass upon FPL's point that if all assumptions of the Commission were accepted, and there was some basis for Commission jurisdiction, nevertheless it was an abuse of discretion for the Commission to fail to decline to exercise that jurisdiction.[66]

The *Connecticut* case as well as the *City of Colton* case recognizes that in straight transmission cases the Commission has discretion to decline to exercise its jurisdiction.[67] In the *Connecticut* case the interstate energy in question was one-fifth of 1% of all the energy generated and received.[68] In the present case, if we assume arguendo that the Commission's tracing theory is correct, still the interstate energy would be only 0.07% of all the energy received by FPL from Corp, and only 0.00015% of the energy delivered by FPL to its consumers.[69]

The *City of Colton* case, citing the *Connecticut* opinion, agrees that the fact that any out-of-state energy would be *de minimis* was relevant on the question of whether a particular company was a "public utility" over which the Commission in its discretion should assume jurisdiction.

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be considered were those of the regulated company. But state lines and boundaries cut across and subdivide what scientifically or economically viewed may be a single enterprise. Congress is acutely aware of the existence and vitality of these state governments. It sometimes is moved to respect state rights and local institutions even when some degree of efficiency of a federal plan is thereby sacrificed." 324 U.S. at 530.

[66] The court below did take notice of a disturbing factor: "[T]he implication by the majority of the Commission in the present case that they may be of the view that if the Commission has jurisdiction it cannot in the exercise of discretion decline to exercise it." App. 373.

[67] 324 U.S. at 535; 376 U.S. at 209.

[68] 324 U.S. at 536.

[69] App. 89.

Where jurisdiction derives from this *de minimis* amount of assumed out-of-state energy, and where there is no evidence that would indicate FPL's six sales for resale might be shown to be made with interstate energy, the imposition of the financial burdens of regulation,[70] which will in all likelihood never be transformed into Commission-set rates, is a high price for FPL's customers to pay for some vague "benefits" never clearly defined in the record.

When this Court reversed the Commission's finding of jurisdiction over Connecticut Light & Power Co., it took note of the business of that company as follows:

> "[T]he predominant characteristic of the company's over-all operation is that of a local and intrastate service. It serves one hundred seven towns, cities, and boroughs of Connecticut with a total population of about 660,000, and in addition supplies substantially all the power used by local companies which serve communities of Connecticut having a population of 130,000. It owns no lines crossing the Connecticut boundary and does not conect with any other company at the boundary. It has no business other than Connecticut service for which it needs any facilities whatever, and if local distribution service were terminated, no remaining purpose or use of any kind is suggested for the facilities in question. Its purchases and sales, its receipts and deliveries of power, are all within the state. Its rates and its fiscal and accounting affairs are fully and so far as appears effectively regulated by the State of Connecticut."[71]

On remand the Commission agreed that Connecticut Light

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[70] Changing from FPL's present accounting system, which is in accordance with the system of accounts of National Association of Railroad and Utility Commissioners as prescribed by the Florida Public Service Commission, to the FPC's Uniform System of Accounts will mean incurring substantial clerical and accounting expense.

[71] 324 U.S. at 521-522.

& Power should not be required to change its system of accounts or be otherwise subject to regulation.[72]

The foregoing quotation could well apply to FPL (except for the even small number of sales for resale made by FPL).

For the foregoing reasons FPL submits that it is not subject to Commission regulation, nor should it be.

[72] *Connecticut Light & Power Company*, 6 F.P.C. 104 (1947).

CONCLUSION

WHEREFORE PREMISES CONSIDERED, the judgment of the Court of Appeals should be affirmed.

Respectfully submitted,

LEON JAWORSKI
JEFFERSON D. GILLER
JAY W. ELSTON
FULBRIGHT, CROOKER & JAWORSKI
800 Bank of the Southwest Building
Houston, Texas 77002

HARRY A. POTH, JR.
RICHARD M. MERRIMAN
REID & PRIEST
1701 "K" Street, N.W.
Washington, D.C. 20006

Attorneys for Respondent

PROOF OF SERVICE

Service of this Brief for the Respondent Florida Power & Light Company has been made upon the Federal Power Commission by mailing copies hereof airmail postage prepaid to Mr. Erwin N. Griswold, Solicitor General, Department of Justice, Washington, D. C. 20530 this .... day of July, 1971

.....
Attorney for Respondent

In the United States Court of Appeals for the Fifth Circuit

No. 24956

FLORIDA POWER & LIGHT COMPANY, PETITIONER

v.

FEDERAL POWER COMMISSION, RESPONDENT.

PETITION TO REVIEW AND SET ASIDE OPINION AND ORDERS OF THE FEDERAL POWER COMMISSION (FLORIDA CASE)

(July 13, 1970)

Before BELL, AINSWORTH and GODBOLD, *Circuit Judges.*

GODBOLD, *Circuit Judge:* Florida Power & Light Company (FPL) petitions for review of a determination,[1] reached by the Federal Power Commission on a 3–2 vote, that it is a public utility within the meaning of § 201 of the Federal Power Act, 16 U.S.C. § 824(e). We reverse the Commission and set aside its order.

The term "public utility" means "any person who owns or operates facilities subject to the jurisdiction of the Commission under sections 824–824h of this

[1] 37 F.P.C. 544.

title." 16 U.S.C. § 824(e). "The provisions of sections 824–824h of this title shall apply to the transmission of electric energy in interstate commerce and to the sale of electric energy at wholesale in interstate commerce * * * The Commission shall have jurisdiction over all facilities for such transmission or sale of electric energy." 16 U.S.C. § 824(b).

The Commission asserts jurisdiction on the ground that FPL owns and operates facilities for the transmission of electric energy in interstate commerce. Jurisdiction over interstate wholesale sales under § 824(b) is not involved.

1. BACKGROUND

FPL's facilities are located wholly within the State of Florida. It has no connections at the state line with any out of state system. Commission jurisdiction is predicated on transmission interstate of FPL-generated power through its interconnection with other electric systems outside of and within Florida, and receipt by FPL, through these interconnections, of power generated outside of Florida.

Congress exercised its power under the Commerce Clause and undertook federal regulation in the interstate electric field as a result of the decision of the Supreme Court in *Public Utilities Commission of Rhode Island v. Attleboro Steam & Electric Co.*, 273 U.S. 83, 71 L.Ed. 549 (1927), holding that neither Massachusetts nor Rhode Island had power to regulate the sale by a Rhode Island utility of electric energy to a Massachusetts utility because the sale was in interstate commerce. There being at that time no federal regulation of interstate sales by electric utilities, Congress acted to close this gap in effective

utility regulation, the "Attleboro gap," by enacting Part II of the Federal Power Act in 1935.

Jurisdiction of the FPC is not based upon a test of effect on interstate commerce but upon interstate transmission of electric energy (or wholesale sales in interstate commerce, not here applicable). 16 U.S.C. § 824(b). To make clear that Commission jurisdiction extends only to transmission or sales "in interstate commerce," the Congress wrote several specific exclusions into the Act.

> * * * such Federal regulation, however, to extend only to those matters which are not subject to regulation by the States.

16 U.S.C. § 824(a). This caveat and the directive that the Act.

> shall not apply to any other sale of electric energy or deprive a State or State commission of its lawful authority now exercised over the exportation of hydro-electric energy which is transmitted across a State line * * *,

16 U.S.C. § 824(b), extend Commission jurisdiction to the limits of but no further than the Attleboro gap. *Connecticut Light & Power Co.* v. *FPC,* 324 U.S. 515 89 L.Ed. 1150 (1945); *Jersey Central Power & Light Co. v. FPC,* 319 U.S. 61, 87 L.Ed. 1258 (1943).

> Likewise, the Commission shall not have jurisdiction, except as specifically provided * * * over facilities used for the generation of electric energy or over facilities used in local distribution or only for the transmission of electric energy in intrastate commerce, or over facilities for the transmission of electric energy consumed wholly by the transmitter.

16 U.S.C. § 824(b). Exemptions are also provided for governmental units and corporations, 16 U.S.C. § 824

(f), for one engaged in transmission or sale of electric energy but not otherwise subject to the Act who makes a temporary emergency connection with a public utility subject to the jurisdiction of the Commission, 16 U.S.C. § 824a(d), and for certain international exports, 16 U.S.C. § 824a(f).

Congress defined interstate transmission as follows:

> [E]lectric energy shall be held to be transmitted in interstate commerce if transmitted from a State and consumed at any point outside thereof.

16 U.S.C. § 824(c). The Supreme Court has credited the Congress with determining that "federal jurisdiction was to follow the flow of electric energy, an engineering and scientific rather than a legalistic or governmental test." *Connecticut Light & Power Co. v. FPC, supra.* Commission power does not extend over all connecting transmission facilities but only those which transmit energy actually moving in interstate commerce. Mere connection determines nothing. *Jersey Central Power & Light Co. v. FPC,* supra, at 72, 87 L.Ed. at 1269.

The concept of following the flow of electric energy from one state to the other was easy to apply in *Attleboro.* A Rhode Island electric company delivered energy over its Rhode Island transmission lines to the facilities of a Massachusetts electric company which had no generating capacity. Now generating companies are interconnected with each other nationwide. Companies have formed area and regional power pools, with varying degrees of integration and centralized management. The Commission itself has power to establish regional districts for voluntary interconnection and coordination of facilities and to promote such interconnection and coordination. 16 U.S.C. § 824a(a).

Interconnection has become a fact of life to meet needs, scheduled and emergency, of localized areas and large regions.[2]

2. THE INSTANT CASE

FPL produces and sells electric energy in eastern and southern Florida. But it is a major electric company.[3]

The Commission opinion describes FPL's interconnections:

> FPL is directly interconnected with four other Florida electric systems, as follows: Florida Power Corporation (Corp), Tampa Electric Company (Tampa), Orlando Utilities Commission (Orlando), and the City of Jacksonville (Jacksonville). FPL, Corp, and Tampa form the Florida Operating Committee (Florida Pool) with Jacksonville and Orlando as associate members. The Florida Pool meets several times a year to consider mutual problems relating to the interconnected operation of the systems, including the coordination of spinning reserves, the arrangement of compatible plant maintenance schedules, and the coordination of plans for the construction of transmission lines and the staggered construction of generating units.
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> * * * * *

[2] The examiner noted the Northeast power failure of 1965, which plunged large sections of the eastern United States into darkness.

[3] In 1965 it served nearly one million customers, ranked ninth nationally among electric companies in revenues, fourteenth in investment in gross electric utility plant, and sixteenth in kilowatt hour sales. Six of its customers are electric cooperatives, and it occasionally sells to municipal electric systems on an emergency basis. Because of the frequent threat of hurricanes severing its transmission lines, FPL attempts to be self-sufficient, even within different segments of its system.

Corp, which is interconnected with Tampa and Orlando as well as with FPL, is also interconnected with power companies outside of the State of Florida. Thus, it is directly interconnected with Georgia Power Company (Georgia), a subsidiary of The Southern Company (Southern). Southern is a holding company whose other subsidiaries are Gulf Power Company (Gulf) which operates in northwestern Florida, Alabama Power Company (Alabama), and Mississippi Power Company (Mississippi). Corp is also directly interconnected with Gulf, and Gulf is interconnected with Georgia and Alabama. Corp has an agreement with the subsidiaries of Southern whereby Corp makes 100,000 kw available to these subsidiaries during the summer, and in return, the subsidiaries make 100,000 kw available to Corp during the winter. During 1964 Southern delivered 167,476,000 kwh to Corp, and Corp delivered 157,324,000 kwh to Southern. Of these totals, approximately 97,000,000 kwh represented deliveries from Georgia to Corp, and 82,000,000 kwh represented deliveries from Corp to Georgia. In addition, 3.9 million kwh were wheeled for the Southwestern Power Administration over Southern's lines across the Georgia-Florida state line to Corp. Georgia is also interconnected with Duke Power Company, Tennessee Valley Authority, and Southeastern Power Administration. These systems operate in states beyond Georgia.

FPL and the other members of the Florida Pool are also members of a multi-state electric network, the Southeast Region of the Interconnected Systems Group (ISG) which covers the southeastern and central portions of the United States. FPL's membership in the ISG provides acceptable frequency control and also automatic assistance during emergencies in the event of any generation outage of less than

> 100 mw on its system. In this connection it may be noted that 12 of FPL's 24 generating units generate 75 mw or less. An outage of any of these units would lead to almost instantaneous assistance to FPL. FPL, in turn, operates in synchronism with the 140 members of ISG and is ready to assist them in case of emergency. Thus, FPL contributed 8 mw to ISG to assist a midwestern utility which had sustained a 580-mw generator loss.

The Commission position is best explained by quoting from its opinion:

> The testimony and evidence of record support the examiner's findings that the electric power on all the interconnected systems in which FPL, Corp, and Georgia participate is supplied as alternating current at a frequency of 60 cycles; that the frequency of each system is in synchronism with that of all the others in the interconnection; that there is a tie-line bias with frequency control on the interconnected systems which permits a free flow of power and energy throughout the networks in which FPL, Corp, and Georgia participate; that all 140 members of the ISG operate in parallel and are interlocked electromagnetically; and that FPL can receive from or contribute to ISG up to 100 mw. The record further supports the examiner's findings that FPL normally has no control over the actual transfers of electric power and energy with any particular electric system with which it is interconnected; that since electric energy can be delivered virtually instantaneously when needed on a system at a speed of 186,000 miles per second, such energy can be and is transmitted to FPL when needed from out-of-state generators, and in turn can be and is transmitted from FPL to help meet out-of-state demands; and finally, that there is a cause and effect relationship in electric

> energy occurring throughout every generator and point on the FPL, Corp, Georgia, and Southern systems which constitutes interstate transmission of electric energy by, to, and from FPL.
>
> In its exceptions FPL argues that there is no substantial record support for the examiner's finding that it is engaged in the transmission of electric energy in interstate commerce. We find no merit in this argument. The examiner concluded that the operation in FPL in electromagnetic unity with the suppliers in and outside of Florida in and of itself demonstrated that it owned and operated facilities for the interstate transmission of electric energy. This finding is also supported by the evidence produced by staff at the hearing which convincingly establishes that electric energy is transmitted in interstate commerce to and from FPL's lines.

The Commission adopted the examiner's findings. Two are basic. First, that ownership and operation of facilities for interstate transmission was proved by reason of FPL's interconnection with other systems inside and outside of Florida "in electromagnetic unity of response," without any necessity of tracing the path of any interstate electrical energy. Second, that if tracing was considered essential, there had been interstate transmission to and from FPL's lines, based on the Commission's staff studies, which were predicated upon the "commingling theory" of the transmission of electric energy. It is not clear to us whether the examiner and the majority of the Commission considered commingling as undergirding the electromagnetic unity of response theory or as irrelevant to it. The dissenters appeared to treat the two concepts as one, pursuant to which at all times an interconnected network is "permeated" with free flowing electric energy.

The nature and effects of the concept of "electromagnetic unity of response" were described by the examiner approximately as follows. The interconnected systems supply alternating current on the same frequency, 60 cycles per second, with the frequency of each system in synchronism with that of all other systems in the interconnection. The speed of all generators on the interconnected systems is irrevocably locked to the same frequency. A response mechanism known as tie line bias control regulates output in individual systems so that total overall generation matches as closely as possible the total overall load. When at any point a change in load occurs or a generator is taken out of service, this will affect every point on the interconnected systems. For example, every connected generator on the interconnected systems will contribute energy to compensate for any additional load to maintain the balance between total overall generation and total overall load and thereby maintain frequency at 60 cycles. The immediate effects of load or generation changes are dispersed throughout the electromagnetically interlocked generators of the interconnected systems. The magnitude of change in instantaneous generation and frequency will tend to diminish as the distance from the point of load or generation change increases. As such changes occur tie line bias control operates to restore the net interchange of power between each system and its neighbors to the former prearranged level.[4]

[4] The automatic, nonscheduled transfers effected by tie line bias control are not the sole or even the most important transfers among systems. For a variety of reasons, electric companies agree to swap power. Scheduled transfers include seasonal sales, like those between Southern and Corp; other economy sales, made profitable by differences in marginal efficiency among production plants, Indiana and Michigan Electric Co. v. FPC, 365

In our example above, the particular system on which total load increased will automatically increase its own generation to supply the additional load, and the other systems correspondingly will reduce their temporarily increased electric generation. No attempt is made to control flows of electric energy in individual lines (in fact, electric systems normally have no control over actual transfers of energy between them, if there is more than one interconnection), because the flows are determined by the electric characteristics of the overall network. Only the net of flows is controlled, by increasing or decreasing generation so as to maintain scheduled transmissions of power (both within a system and between systems). Thus there is free flow of electric energy throughout the overall network but limited by control of the net of flows, frequency changes, tie line bias, and the responses of generators to load changes.

The examiner stated that nobody can say for certain just how electricity is really transmitted, but that "the answer is not important for legal purposes." He found:

> The cause and effect relationship in electric energy occurring throughout every generator and point on the Georgia, Corp and Florida systems constitutes interstate transmission of electric energy by, to, and from Florida. It is the electromagnetic unity of response of Florida, Corp, Georgia and other interconnecting systems that constitutes the interstate transmission of electric energy by Florida.

F.2d 180 (7th Cir.); *cert. denied*, 385 U.S. 972, 17 L.Ed. 2d 435 (1966); and transfers to compensate for temporary needs such as plant maintenance, as in the Florida Operating Committee arrangements.

We conclude that the complex relationship of cause and effect in interconnected and synchronized systems is, as to FPL, not sufficient to prove the actual transmission of energy interstate. It tells us what, as to that company, could occur. It does not tell us with any substantial degree of certainty what does occur.

This is not to say that "electromagnetic unity of response," with the reasonable inferences which may be drawn therefrom, may not be a part of substantial evidence of interstate transmission, as in the "power pool" cases discussed below. But, standing alone, as to FPL it is not substantial evidence establishing that when energy flows from Corp's lines to Georgia's lines, either scheduled or in response to frequency drop in the state of Georgia or somewhere further distant, the Florida power transmitted is Corp's plus FPL's and not Corp's alone, and conversely that when energy flows from Corp to FPL it is not Corp's alone but mixed with power generated outside Florida.[5] The Commission referred, at the end of the excerpt first above quoted, to FPL's contribution of 8 mw to ISG during an outage in the midwest. That "contribution" does not necessarily mean that power was transmitted interstate from FPL to the midwest. Although the effect of FPL's transmission was to increase the total wattage available to the whole system,

[5] We have focused, as did the examiner and the Commission, on interstate transmission in terms of FPL's interconnection with Corp. But the theory of interconnection and synchronization is applicable to the outermost ends of all interconnected systems. Thus, under this theory a direct interconnection of FPL with Corp is unnecessary because, for example, FPL interconnects with Tampa and Orlando in the Florida Pool, and those two companies are interconnected with Corp, which interconnects to Gulf, which interconnects to Alabama.

the "electromagnetic unity of response" theory is equally compatible with either the Commission's "permeation" assumption or the hypothesis that the power transmitted by FPL was consumed by Corp, another eight mw being passed on by Corp for further use or transmission.

Turning to the second basic finding of energy actually traced, the supporting evidence of actual transmissions referred to by the Commission consists of staff studies purporting to trace energy from Georgia through Corp's substation in Florida into FPL's system, and at other times over the same lines from FPL to Corp to Georgia. These studies are predicated upon the commingling theory, which is simply a method of conceptualizing the complex and not yet fully explainable flow of electric energy. FPL asserted the validity of a different theory, the "systems study method."[6] The difference between this method and the commingling method relied on by the Commission lies in their assumptions about the nature of the transmission bus, a collection and transmission facility for electric power, for example, a substation. The systems study method assumes that it is possible to measure the magnitude and direction of flows within a bus as well as along transmission lines between buses. Relying on this assumption, FPL introduced measurements tending to show that for each point in time at which the Commission attempted to trace power from Georgia to FPL there was in fact a reversal in flow through the bus away from FPL's connection either on the Corp-FPL bus or on some other bus earlier in the trace through Corp's system. Finding on each bus

[6] This is a variation of the so-called steady state method used for accounting and planning purposes in the electric power industry.

the connection which brought power from the direction of Georgia, and totaling the inputs and outflows through other connections on the bus in the direction of FPL's connection, FPL calculated that inputs over this part of the bus were greater than outflows. Under the systems study assumptions, then, power could only flow in the opposite direction through the bus, away from FPL's connection.

The staff did not disprove the correctness *vel non* of these measurements by FPL.[7] Instead the staff urged that the steady state method of describing the flow of three-phase power is inadequate and that the flow is best conceptualized by the commingling theory.

Modern electric utilities generate alternating current electricity. The steady state method treats the flows and counterflows of alternating current as unidirectional and measures only the net of the flows and counterflows. This simply ignores that alternating current is not unidirectional.[8] The commingling concept too treats power flows as only net quantities. But the bus is treated as a "tank" or a "reservoir." The energy flowing to each load on the bus is attributed to each source of energy in the proportion that the source contributes to the total energy flowing into the bus. If at any instant the net flow of power is toward a system—that is, its load is more than its generation—it is assumed that at that moment some portion of the

[7] Counsel for the Commission attempted to do so by a chart, first presented on appeal, which purported to show by the steady state method that interstate power reached FPL. The petitioner did not have a chance to question or controvert in a factual hearing assumptions underlying this chart, so we may not consider it on this appeal.

[8] Staff experts testified that the deficiencies of the steady state method could be corrected by measuring counterflows of energy.

power being consumed by that system flowed into it from every other system contributing to the "tank" or "reservoir" at the bus.[9] Neither the examiner nor the Commission treated the commingling theory as a scientific fact depicting accurately what does occur but only as the more adequate way to conceptualize actual occurrences.[10]

The Commission expert witness Jacobsen acknowledged commingling has never been verified experimentally as fact. The following interchange took place during the hearing before the examiner:

> PRESIDING EXAMINER. I take it the theories are not necessarily right or wrong. How does your theory better explain the facts?
>
> THE WITNESS. [Commission expert]: I think that would be a better question.

In some contexts the commingling method may be a more useful tool for analysis than steady state methods, but this is not to say that it is adequate for all purposes. Both suffer from the same vice of creating a construct which departs from the actual manner in which electricity operates and then attempting to trace the consequences. The engineering and scientific fact test for interstate flow of energy is not met by postu-

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[9] Although we do not rest our decision on this testimony, we note that an expert for FPL calculated that, if it be conceded that commingled power flowed from Georgia to FPL under the Commission's assumptions, the interstate component of the power flowing from Corp into the FPL substation at Sanford, Florida would be only 0.07%, and that as a portion of the energy then being delivered by FPL to its consumers, this interstate energy would amount to only 0.00015%.

[10] Thus the examiner stated:

> "[S]everal explanations may be sufficient [to account for the amount of electric energy at any one point] but none may possess the uniqueness necessary for proof."

lating a simplified characterization of how, for various purposes of convenience, energy may be treated as flowing.

3.

The "engineering and scientific" test based on actual power flow was articulated in *Connecticut Light & Power*. In that case, in the next following words the Supreme Court said:

> Technology of the business is such that if any part of a supply of electric energy comes from outside of a state it is, or may be, present in every connected distribution facility.

324 U.S. at 529, 89 L.Ed. at 1160. We do not construe this language as obviating the necessity for showing interstate transmission of power. In context the Supreme Court was discussing not the technological transmission test but the exception from FPC jurisdiction of "facilities used in local distribution." 16 U.S.C. § 824.

The Commission bears the burden of proving its asserted jurisdiction. *Public Service Co. of Indiana v. FPC,* 375 F.2d 100, 104 (7th Cir.), *cert. denied,* 387 U.S. 931, 18 L.Ed. 2d 992 (1967); *Arkansas Power & Light Co. v. FPC,* 368 F.2d 376 (8th Cir. 1966). In attempting to meet this burden, the Commission does not rely upon the two "straight status" cases that have been adjudicated by the Supreme Court, *Connecticut Light and Power* and *Jersey Central,* neither of which supports its approach in this instance. Instead it turns to the cases in which jurisdiction has been found over wholesale sales "in interstate commerce" and adapts their methodology. *Cincinnati Gas & Elec. Co. v. FPC,* 376 F.2d 506 (6th Cir.), *cert. denied,* 389 U.S. 842, 19 L.Ed. 2d 106 (1967); *Public Serv-*

ice Co. of Indiana v. FPC, supra; Arkansas Power & Light Co. v. FPC, supra; Indiana and Michigan Electric Co. v. FPC, 365 F.2d 180 (7th Cir.), *cert. denied,* 385 U.S. 972, 17 L.Ed. 2d 435 (1966); see also *Pennsylvania Water & Power Co. v. FPC,* 343 U.S. 414, 96 L.Ed. 1042 (1952). *Pennsylvania Water* concerned wholesale sales of an admitted public utility, as defined by the Act, which was part of a system integrated with a Maryland company. During periods of low flow on the Susquehanna River it received substantial amounts of power from the Maryland company, and it was not contested that some interstate energy reached each of its customers.

Each of the four companies in the "power pool" cases from the Sixth, Seventh and Eighth Circuits was likewise a public utility within the meaning of the Act. Each of them also participated in an integrated power pool centrally directed to maximize efficiency by economy transfers and to provide emergency power. CG&E, PSCI and I&M were all members of the American Electric Power System (AEP) spanning several midwestern states, and Arkansas Power & Light was a member of a similar pool operation including utilities in three southern states.

Each of these cases rests on far more than interconnection plus electromagnetic unity of response plus commingling. In both *CG&E* and *Arkansas Power & Light,* limited samples showed that some of the petitioners' wholesale customers received out of state energy. In each case, the company's principal contention was that tracing was necessary to establish the presence of out of state energy in its wholesale transmissions to its remaining customers as well. In each case the utility's membership in a pool, and its consequent regular purchases for economy and other rea-

sons of power generated in other states, justified an inference that not just some but all of its wholesale sales contained interstate energy.

In *I&M* and *PSCI*, the Commission traced no interstate energy to any wholesale customer. In *I&M*, this may have been unnecessary, since there was evidence that for substantial periods of time Illinois energy supplied at least large portions of north central Indiana and southwest Michigan, thereby bringing this case close to *CG&E* and *Arkansas Power & Light*, *PSCI* is the most far-reaching case. But the court in that case rested squarely on *I&M*, finding that the company's participation in the integrated AEP network, in view of the impossibility of tracing, justified the inference that some of the interstate power which demonstrably flowed in PSCI's lines reached each of its wholesale customers.

We agree with the court in *Arkansas Power & Light, supra*, at 383, n.8, that establishing wholesale rate jurisdiction over an electric company which is a public utility within the Act is a different matter from establishing plenary jurisdiction over a company based on interstate transmission. A consideration in the wholesale sale case is the seeming irrationality of allowing Commission jurisdiction over wholesale sales to which experts can trace some out of state energy, but not over those to which it might be impossible to trace interstate power, when it is obvious that there is interstate power in substantial portions of the utility's system. *Cf Arkansas Power & Light, supra.* Another consideration is the seeming irrationality of a public utility with interstate electric energy flowing in its system escaping FPC jurisdiction over wholesale sales because of impossibility of proof arising from the inadequacy of instruments used by the utility itself. *Cf. Indiana & Michigan, supra.* These con-

siderations have little application to the problems of federalism and reservations of power to the states imposed by the instant case, where the issue is one of whether FPL is a public utility at all, measured under tests articulated by the Congress and the courts in terms of actual transmissions of interstate energy.

Some of the wholesale rate cases have relied heavily on the respective companies' participation in an integrated interstate power pool, which provided power more or less continuously, in substantial amounts, and with economy transfers. Neither FP[L] nor Corp is shown to be a member of such a pool.

To the extent that the above wholesale rate decisions purport to rest on a theory of commingling, that theory is nowhere discussed in the context in which it is presented in this case. The term "commingled" appears to have originated in *Pennsylvania Water,* where it was used as a descriptive term for the Court's conclusion that some interstate power must have reached each wholesale customer. None of the subsequent power pool cases gives extended discussion to the scientific ramifications of the Commission's similarly conclusory findings that commingled energy reached each wholesale customer.

The consequences of the Commission's electromagnetic unity theory, with or without the additive of the commingling concept, as a basis for jurisdiction were described by the dissenters in this way:

> The vice I find in the Commission's decision, which prevents me from joining in its statement, is that its adoption of the commingling theory as a test for jurisdiction *per se,* interprets the Federal Power Act to have a reach beyond that which I find in the statute.
>
> The Federal Power Act is today found to grant to the Commission jurisdiction over *any*

company which generates electric energy in the form of alternating three-phase 60-cycle current, if that company is interconnected and electromagnetically synchronized with any other generating source producing electric energy in the same form in another State.

More than 90% of the Nation's electric generating capacity is interconnected in this fashion.[11] The only major exception is the electric generation of Texas, which is interconnected within Texas but not with out-of-Texas systems. Such a test for jurisdiction writes out of the statute the intrastate and industrial exceptions to coverage under the Act, and in doing so objectionably usurps a prerogative of the Congress.[12] (Emphasis in original.)

* * * * *

If commingling obviates tracing, then the reach of the Commission's jurisdiction is plenary. Furthermore, it has become plenary in 1967, while the act was passed in 1935 and has not been changed by Congress (in respects material here) since.

* * * * *

The stated purpose of section 202 was to assure an abundant supply of economical energy by *voluntary* interconnection of facilities. If jurisdiction inexorably follows interconnection, the nonjurisdictional utilities cannot retain any aspect of their independence once they agree

[11] The examiner's description of scope was no less cogent.

"The electric systems of Florida and all other interconnected systems are essentially alike as to electrical, electromagnetic and electromechanical characteristics. Because they are alike, it is possible to have presently existing interconnected operations on a very large scale, extending from the Rocky Mountains to the Atlantic Ocean and from the Canadian to the Mexican border.

[12] The exceptions are set out in part 1 of this opinion.

> to interconnect. Impregnation is indivisible. Such a reading of section 202 is hardly conformable to its general spirit, and is inconsistent with the legislative history, of this part of the Act. (Emphasis in original.)

The qualities of electric energy have long been familiar. If the free flowing character of electricity *vel non* proved interstate transmission then connection, rather than proving nothing, *Jersey Central Power & Light Co. v. FPC, supra,* at 72, 87 L.Ed. 2d at 1269, proves everything, if it is made to any point of the synchronized system that spans most of this country.

The impact of these consequences is pointed up by two other factors: the principle that for determining existence of jurisdiction the quantity of energy transmitted interstate is immaterial,[13] and the implication by the majority of the Commission in the present case that they may be of the view that if the Commission has jurisdiction it cannot in the exercise of discretion decline to exercise it.

To attach federal agency jurisdiction is to supplant[14] or parallel[15] the regulatory schemes of the states. Congress avoided any such entry into the field where the Attleboro gap poses no bar to state regulation.

What the Commission virtually argues for in this case is extension of its jurisdiction to all electric companies affecting interstate commerce. Our society grows increasingly more complex, more dependent

[13] Connecticut Light and Power Co. v. FPC, *supra;* Wisconsin-Michigan Power Co. v. FPC, 197 F.2d 472, 478 (7th Cir.) *cert. denied*, 345 U.S. 934, 97 L.Ed. 1362 (1953).

[14] *E.g.*, in wholesale ratemaking, 16 U.S.C. § 824d.

[15] *E.g.*, in accounting requirements, 16 U.S.C. § 825.

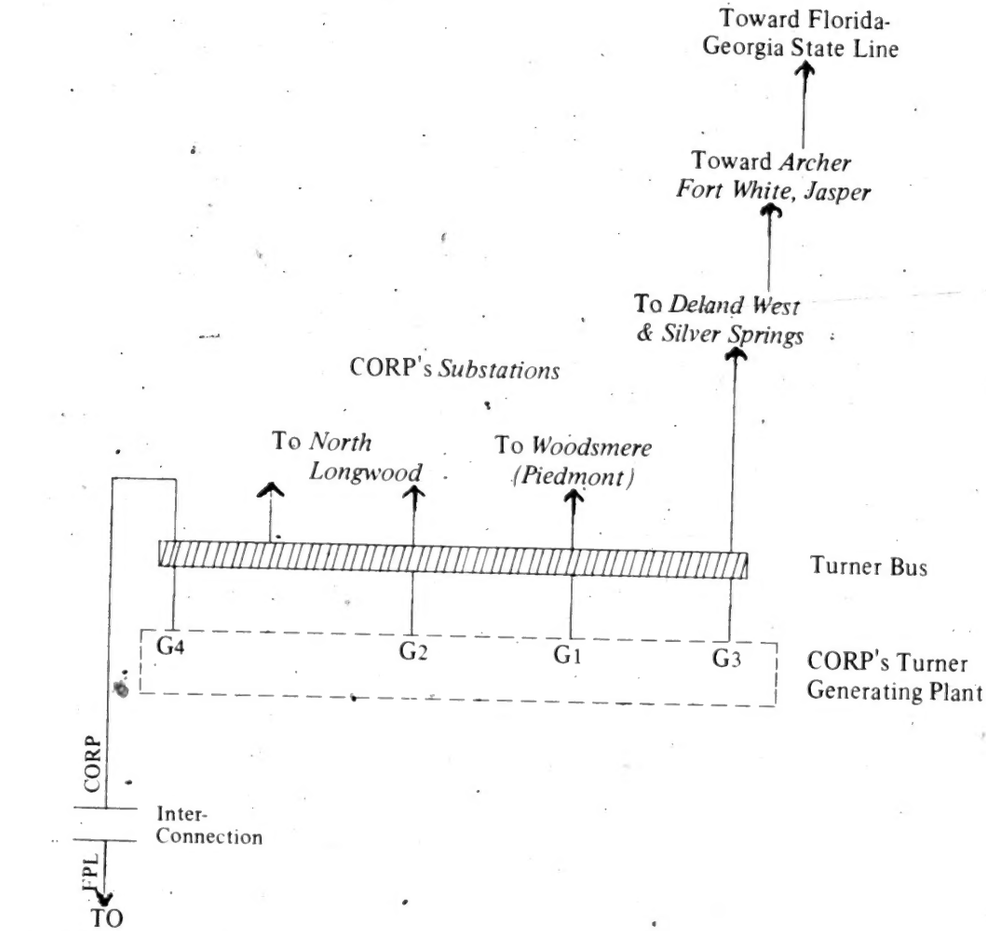
upon electric energy, and the interconnection of electric systems is ever more pervasive. But such an extension of Commission power, if determined to be in the national interest, is for the Congress and not for this court.

The petition for review is *granted* and the order of the Commission is *reversed.*

EXHIBIT B

TURNER BUS

Turner Plant Substation of
Florida Power Corporation (CORP)



Supreme Court, U.S.
FILED
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L. ROBERT SEAVER, CLERK

IN THE

Supreme Court of the United States

OCTOBER TERM, 1971

No. 70-38

FEDERAL POWER COMMISSION,
Petitioner,

v.

FLORIDA POWER & LIGHT COMPANY,
Respondent.

ON WRIT OF CERTIORARI TO THE
UNITED STATES COURT OF APPEALS
FOR THE FIFTH CIRCUIT

PETITION FOR REHEARING FOR THE RESPONDENT FLORIDA POWER & LIGHT COMPANY

LEON JAWORSKI
JEFFERSON D. GILLER
JAY W. ELSTON
FULBRIGHT, CROOKER & JAWORSKI
800 Bank of the Southwest Building
Houston, Texas 77002
HARRY A. POTH, JR.
RICHARD M. MERRIMAN
REID & PRIEST
1701 "K" Street, N.W.
Washington, D.C. 20006
Attorneys for Respondent

February, 1972

FIDELITY PRINTING COMPANY, INC., HOUSTON

IN THE

Supreme Court of the United States

OCTOBER TERM, 1971

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FEDERAL POWER COMMISSION,
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v.

FLORIDA POWER & LIGHT COMPANY,
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ON WRIT OF CERTIORARI TO THE
UNITED STATES COURT OF APPEALS
FOR THE FIFTH CIRCUIT

PETITION FOR REHEARING FOR THE RESPONDENT FLORIDA POWER & LIGHT COMPANY

Pursuant to Supreme Court Rule 58, Florida Power & Light Company ("FPL"), Respondent herein, respectfully petitions this Court for rehearing of its decision of January 12, 1972 in this cause.

This Court's Opinion determined there is jurisdiction by the Federal Power Commission (the "Commission") over FPL because it found there was substantial evidence to support the Commission's method of tracing. FPL requests

a rehearing on the grounds that this Court overlooked the Commission's use of an *erroneous legal standard* in its tracing technique upon which jurisdiction was based.

The legal standard under the Federal Power Act for determining jurisdiction is interstate transmission of "electric energy".[1] The Commission's jurisdiction under its tracing method was not determined here by the flow of electric energy, but instead the Commission made its determination based upon the flow of "reactive power". Reactive power is not electric energy, and therefore the Commission used the wrong legal standard.

The critical issue with respect to the Commission's tracing technique is whether the Commission could properly ignore the realities of a 225-foot bus and treat it as a point or a reservoir or a tank in which electric energy is commingled, like molecules of water from different sources, rather than treat it like the short piece of transmission line that it is (Slip Opinion pp. 8-10).[2]

The Commission's *sole* excuse for treating a 225-foot bus as a point or reservoir is because in an alternating current flow (whether it be three phase or not) there is a small amount of each fraction of a second during which "power" in each phase flows back from the load to the generator. Rather than having to trace or show these counterflows of "power", the Commission finds it simpler to speak of the bus as a reservoir in which commingling of "power" takes place (App. 146, 147, 150, 151, 154, 155).

The proposition that each cycle of "power" includes a small portion of a negative or reverse "power" (that is,

[1] 16 U.S.C. § 824.

[2] The importance of this commingling is emphasized by this Court in the following words: "If the Commission's conclusion of commingling is not overturned, then the legal consequences are clear". Slip Opinion p. 10.

reactive power is misleading. *The reactive power that is reversing is not electric energy.* The statutory standard is interstate transmission of "electric energy" — not "reactive power". *Electric energy never has a reverse pulse.* It is furnished by the generator to the load. The load does not furnish electric energy to the generator.

Since the controlling issue in the case is whether "electric energy" is transmitted in interstate commerce, its definition is important. It is defined by the Commission as follows:

> "ENERGY — *that which does or is capable of doing work.* It is measured in terms of the work it is capable of doing; electric energy is usually measured in kilowatt-hours."[3]

The "power" diagrams used by the Commission's expert in an attempt to establish a small reverse flow of "power" are diagrams of *apparent* power.[4] Apparent power is composed of both *real* power and *reactive* power. Reactive power is that portion of apparent power that *does not work*, and is therefore no part of electric energy. However *real* power is that part of apparent power which is work producing, and which is electric energy at any one instant.[5]

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[3] *Glossary of Important Power and Rate Terms, Abbreviations, and Units of Measurements* promulgated by the FPC in 1965, p. 6.

[4] Ex. 58, App. 240; Ex. 59, R. 1252; Ex. 60, R. 1253

[5] The terms "apparent power", "reactive power" and "real power", are defined as follows:
"APPARENT — Apparent power is proportional to the mathematical product of the volts and amperes of a circuit. This product generally is divided by 1,000 and designated in kilovoltamperes (kVA). It is comprised of both real and reactive power."
"REACTIVE — *The portion of 'Apparent Power' that does no work.* It is commercially measured is kilovars. Reactive power must be supplied to most types of magnetic equipment, such as motors. It is supplied by generators or by electrostatic equipment, such as capacitors."

Real power, that is, instantaneous electric energy, never has a reverse pulse, and this is admitted by the Commission's expert (App. 174).

Because the Commission based its jurisdiction upon the flow of *reactive power* rather than upon the statutory standard of *electric energy*, the decision of the Court of Appeals should have been upheld. This Court's deference to the expertise of the Commission does not include deference to its choice of a legal standard other than the statutory one. *Federal Power Commission* v. *Sierra Pacific Power Co.*, 350 U.S. 348 (1956).

This is not a case where it can be inferred that given enough time and enough data the Commission could establish an interstate flow of electric energy. The Examiner, whose findings were approved by the Commission, found:

> "On the basis of the commingled method, it can be proved that electric energy is transmitted between Florida (FPL) and Georgia (Georgia Power); on the basis of the systems study method the contrary follows." (App. 272)

The Commission's problem is the absence of interstate transmission of electric energy. It should not be allowed to extend its jurisdiction beyond the statutory standard of electric energy.

CONCLUSION

WHEREFORE, PREMISES CONSIDERED, Respondent prays that this petition for rehearing be granted, that the former

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"REAL — *This is the energy or work-producing part of 'Apparent Power.'* It is the rate of supply of energy, measured commercially in kilowatts. *The product of real power and length of time is energy*, measured by watthour meters and expressed in kilowatthours."

Glossary of Electric Utility Terms prepared by the Statistical Committee of the Edison Electric Institute, pp. 62, 63.

opinion be withdrawn, and that the judgment of the Court of Appeals be affirmed.

Respectfully submitted,

Original Signed By
Leon Jaworski

LEON JAWORSKI
JEFFERSON D. GILLER
JAY W. ELSTON
FULBRIGHT, CROOKER & JAWORSKI
800 Bank of the Southwest
Building
Houston, Texas 77002

HARRY A. POTH, JR.
RICHARD M. MERRIMAN
REID & PRIEST
1701 "K" Street, N.W.
Washington, D.C. 20006

CERTIFICATE UNDER RULE 58

I certify that this Petition for Rehearing is presented in good faith and not for delay.

Original Signed By
Leon Jaworski

Leon Jaworski

PROOF OF SERVICE

Service of this Petition for Rehearing for the Respondent Florida Power & Light Company has been made upon the Federal Power Commission by mailing copies thereof air-mail, postage prepaid to Mr. Erwin N. Griswold, Solicitor General, Department of Justice, Washington, D. C. 20530 this 31 day of January, 1972.

Original Signed By
JEFFERSON D. GILLER

Attorney for Respondent

Syllabus

FEDERAL POWER COMMISSION *v.* FLORIDA POWER & LIGHT CO.

CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FIFTH CIRCUIT

No. 70–38. Argued November 15, 1971—Decided January 12, 1972

The Federal Power Commission (FPC) properly determined that the transfer of power from Florida Power & Light Co. (FP&L) to another Florida utility's "bus" (a transmission line into which subsidiary lines connect) and the simultaneous transfer of power from that utility's "bus" to a Georgia company gave the FPC jurisdiction over FP&L under § 201 (b) of the Federal Power Act, which grants jurisdiction to the FPC over "the transmission of electric energy in interstate commerce . . . and the sale of electric energy at wholesale in interstate commerce, but . . . not [over] any other sale of electric energy." The FPC's conclusion that FP&L energy was commingled with that of the other Florida utility, and thus was transmitted in interstate commerce, was substantially supported by expert opinion that is in accord with the known facts of electricity, and is sufficient to support its jurisdiction. Pp. 454–469.

430 F. 2d 1377, reversed and remanded.

WHITE, J., delivered the opinion of the Court, in which BRENNAN, MARSHALL, and BLACKMUN, JJ., joined. DOUGLAS, J., filed a dissenting opinion, in which BURGER, C. J., joined, *post*, p. 469. STEWART, POWELL, and REHNQUIST, JJ., took no part in the consideration or decision of the case.

Samuel Huntington argued the cause for petitioner. With him on the brief were *Solicitor General Griswold*, *Gordon Gooch*, and *Drexel D. Journey*.

Jefferson D. Giller argued the cause for respondent. With him on the brief were *Leon Jaworski*, *Jay W. Elston*, *Harry A. Poth, Jr.*, and *Richard M. Merriman*.

Briefs of *amici curiae* urging reversal were filed by *George Spiegel* and *Melvin Richter* for the Gainesville Utilities Department et al., and by *Northcutt Ely* for the American Public Power Assn.

MR. JUSTICE WHITE delivered the opinion of the Court.

We are asked to determine whether the Federal Power Commission exceeded its statutory authorization when it asserted jurisdiction over the Florida Power & Light Co. Section 201 (b) of the Federal Power Act, as amended, 49 Stat. 847, 16 U. S. C. § 824 (b), grants the Federal Power Commission jurisdiction over "the transmission of electric energy in interstate commerce and . . . the sale of electric energy at wholesale in interstate commerce, but . . . not [over] any other sale of electric energy . . . ." Section 201 (c) defines energy transmitted in interstate commerce as energy "transmitted from a State and consumed at any point outside thereof." [1] In *Connecticut Light & Power Co.* v.

[1] The relevant sections of 16 U. S. C. § 824, stated in full, are as follows:

"(a) It is declared that the business of transmitting and selling electric energy for ultimate distribution to the public is affected with a public interest, and that Federal regulation of matters relating to generation to the extent provided in this subchapter and subchapter III of this chapter and of that part of such business which consists of the transmission of electric energy in interstate commerce and the sale of such energy at wholesale in interstate commerce is necessary in the public interest, such Federal regulation, however, to extend only to those matters which are not subject to regulation by the States.

"(b) The provisions of this subchapter shall apply to the transmission of electric energy in interstate commerce and to the sale of electric energy at wholesale in interstate commerce, but shall not apply to any other sale of electric energy or deprive a State or State commission of its lawful authority now exercised over the exportation of hydroelectric energy which is transmitted across a State line. The Commission shall have jurisdiction over all facilities for such transmission or sale of electric energy, but shall not have jurisdiction, except as specifically provided in this subchapter and subchapter III of this chapter, over facilities used for the generation of electric energy or over facilities used in local distribution or only for the transmission of electric energy in intrastate commerce, or

FPC, 324 U. S. 515 (1945), we noted that by this definition the initial jurisdictional determination "was to follow the flow of electric energy, an engineering and scientific, rather than a legalistic or governmental, test." *Id.*, at 529; *FPC* v. *Southern California Edison Co.*, 376 U. S. 205, 209 n. 5 (1964).

In the case now before us the FPC hearing examiner and the Commission itself, utilizing two scientific tests, determined that the Florida Power & Light Co. (FP&L) generates energy which is transmitted in interstate commerce. They therefore held the company subject to the Commission's jurisdiction. Respondent FP&L argues that an alternative model better represents the flow of its electricity; by use of this model it purports to demonstrate that its power has not flowed in interstate commerce. The Court of Appeals for the Fifth Circuit rejected the FPC's tests as "not sufficient to prove the actual transmission of energy interstate." *Florida Power & Light Co.* v. *FPC*, 430 F. 2d 1377, 1383 (1970). It did not approve FP&L's test ("Both [the FPC and the FP&L tests] suffer from the same vice," *id.*, at 1385), but because the FPC must shoulder the burden of proof, its finding of jurisdiction was set aside.

We granted certiorari to determine if either of the FPC's tests provides an acceptable basis at law and a sufficient basis in fact for the establishment of jurisdiction. 401 U. S. 907 (1971).

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over facilities for the transmission of electric energy consumed wholly by the transmitter.

"(c) For the purpose of this subchapter, electric energy shall be held to be transmitted in interstate commerce if transmitted from a State and consumed at any point outside thereof; but only insofar as such transmission takes place within the United States.

"(d) The term 'sale of electric energy at wholesale' when used in this subchapter, means a sale of electric energy to any person for resale."

I

FP&L is Florida's largest electric utility. At the time relevant to this litigation it served nearly one million customers, ranked ninth nationally among electric companies in revenues, 14th in investment in gross utility electric plant, and 16th in kilowatt-hour sales. Despite this significant size, the peninsular nature of Florida, the concentration of the company's sales in the southern part of the State,[2] and the recurrent threat of hurricanes which might sever power lines combine to make the operations of the company unusually insular and independent of the operations of like companies in other States. All of FP&L's equipment, including transmission lines, is confined to Florida and none of its lines directly connect with those of out-of-state companies.

FP&L does, however, indirectly connect with out-of-state companies. As a member of the Florida Pool, it is interconnected with the Florida Power Corp. (Corp),[3] the Tampa Electric Co., the Orlando Utilities Commission, and the City of Jacksonville. These interconnected utilities and authorities coordinate their activities and exchange power as circumstances require.[4] In 1964 FP&L transferred over 107 million kwh to Corp

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[2] Seventy-five percent of FP&L's load is concentrated at the southern tip of Florida, some 400 miles south of the Georgia border. Transcript of Proceedings before the FPC 241. Reprinted in Joint Appendix submitted to this Court. Hereinafter referred to as (T).

[3] Corp was before this Court in *Gainesville Utilities Dept.* v. *Florida Power Corp.*, 402 U. S. 515 (1971), in which case its operations are described in some detail. Corp is a public utility subject to the FPC's jurisdiction.

[4] "The purpose of the energy interchanges is to take care of temporary needs. There are no economy sales (sales by a company that can produce lower cost power to a higher cost producer) because fuel costs are similar for all members [of the Florida Pool]." Opinion of the FPC Hearing Examiner, 37 F. P. C. 544, 562.

and received over 61 million kwh from Corp.[5] If power from FP&L flows in interstate commerce it is because Corp interconnects just short of Florida's northern border with Georgia Power Co.[6] and regularly exchanges power with it.[7] Georgia's lines transmit the power out of or into Florida. There are numerous instances in which transfers between Georgia and Corp are recorded as coinciding with transfers between Corp and FP&L.[8]

The Georgia-Corp interconnection serves another function. Corp, FP&L, and the other Florida Pool participants are members of the Interconnected Systems Group (ISG), a national interlocking of utilities which automatically provides power in case of emergencies. In time of emergency this power also would flow through Corp's links with Georgia. To date FP&L has had no occasion to call for ISG power. But when a midwestern utility sustained a 580-megawatt generating loss, a regularly scheduled 8-megawatt FP&L contribution to the Florida Pool coincided with an 8-megawatt contribution from the pool to the ISG system.

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[5] Hearing Exhibit No. 15, p. 1028 (T).

[6] It has other interconnections across state lines, but we concentrate, as did the FPC, on a single Georgia-Corp connection. If FP&L power is shown to flow through this connection the others need not be considered, because jurisdiction is established. See n. 7, *infra*.

[7] Opinion of the FPC Hearing Examiner, 37 F. P. C., at 564.

[8] FPC staff exhibits revealed 42 instances, discovered by meter readings at selected hours over a four-month period, in which a transfer from Georgia to Corp's bus was instantly followed by a transfer from that bus to FP&L. Hearing Exhibits Nos. 18, pp. 1048–1054 (T), and 19, pp. 1055–1059 (T). Five instances of power flow from FP&L to Corp's bus, followed by transmission from that bus to Georgia were recorded over the same period. Hearing Exhibit No. 32, p. 1116 (T). "For example, Staff's Exhibit No. 18, at page 6, graphically demonstrates that on September 28, 1964, at 7:00 o'clock p. m., there was a flow of 51,000 kw of interstate power from Georgia to Corp and an instantaneous flow of 50,000 kw of . . . power from Corp to FPL." Opinion of the FPC, 37 F. P. C., at 550.

These relationships establish the focal issue in this case. The FPC may exercise jurisdiction only if there is substantial evidentiary support for the Commission's conclusion that FP&L power has reached Georgia via Corp or that Georgia's power has reached FP&L because of exchanges with Corp. What happens when FP&L gives power to Corp and Corp gives power to Georgia (or vice versa)? Is FP&L power commingled with Corp's own supply, and thus passed on with that supply, as the Commission contends? Or is it diverted to handle Corp's independent power needs, displacing a like amount of Corp power which is then passed on, as respondent argues? Or, as the Commission also contends, do changes in FP&L's load or generation, or that of others in the interconnected system, stimulate a reaction up and down the line by a signal or a chain reaction which is, in essence, electricity moving in interstate commerce? Upon answer to these questions, jurisdiction rides.

If FP&L were directly involved in power exchanges with Georgia, there would be no serious question about the resolution of this case. Section 201 of the Federal Power Act owes its origin to the determination of this Court that a direct transfer of power from a utility in Rhode Island to a utility in Massachusetts is in interstate commerce. See *Public Utilities Comm'n* v. *Attleboro Steam & Electric Co.*, 273 U. S. 83 (1927). "Part II [of the Act] is a direct result of *Attleboro*." *United States* v. *Public Utilities Comm'n of California*, 345 U. S. 295, 311 (1953). There can be no doubt that § 201 achieves its end and fills the "Attleboro gap" by giving the FPC jurisdiction over direct exchanges. *Connecticut Light & Power Co.* v. *FPC*, 324 U. S. 515 (1945).

Nor would there be any difficulty in resolving this case if the company or companies that stood between FP&L and the out-of-state power companies could be shown to be sometimes no more than a funnel. In

Jersey Central Power & Light Co. v. *FPC*, 319 U. S. 61 (1943), the first of the major FPC jurisdictional cases to be considered by this Court, Jersey Central supplied power to the Public Service Electric & Gas Co. (also a New Jersey company), which in turn had exchange arrangements with Staten Island Edison Corp. (a New York company). The transfer from PSE&G to Staten Island was effected through a "bus"—a transmission line of three conductors into which a number of subsidiary lines connect. The FPC showed through extensive sampling of the logs of the relevant companies, that on at least a dozen occasions when Staten Island drew power from the bus only Jersey Central was supplying the bus. Thus, the intermediate presence of PSE&G was shown to be, in some circumstances, a null factor, and it was established that Jersey Central energy was moving in interstate commerce.

In the litigation before us the record does not disclose situations in which Corp operated as a null or insufficient factor. Thus, the FPC has not in this litigation demonstrated with the clarity and certainty obtaining in the *Jersey Central* case that the energy flows that are a prerequisite to jurisdiction occurred.

This is not, however, the equivalent of saying that the flows did not occur or that there was not substantial evidence for concluding that they did. The Court of Appeals was hardly less emphatic than the Federal Power Commission in its conclusion that FP&L's "proof" that the flows did not occur was unconvincing. The court purported to have no opinion whether the flows had actually occurred. The question that must be resolved, therefore, is whether the evidence presented, though not so certain and convincing as that which the FPC offered in *Jersey Central*, was nonetheless adequate to establish jurisdiction.

We turn first to the conflicting contentions of the parties.

II

The Federal Power Commission followed alternate routes to its conclusion that FP&L energy moved in interstate commerce. The first course, based on what the Commission called the electromagnetic unity of response of interconnected electrical systems, is best represented in the words of the hearing examiner:

> "[N]one of the connected electric systems including that of Florida, Corp, and Georgia has any control over the actual transfers of power at each point of interconnection because of the free flow characteristics of electric networks. . . .
>
> "An electric utility system such as Florida [Power & Light] is essentially an electro-mechanical system to which all operating generators on the interconnected network are interlocked electromagnetically. This means that electric generators, under ordinary operating conditions run either at exactly the same speed or at speeds which will result in a frequency of 60 cycles. No operating generator can change its speed by itself as long as it operates connected to the network. All generators connected to the same network must follow each other as to speed and frequency whenever there is a change in frequency, and the frequency of all interlocked generators is always exactly the same.
>
> . . . . .
>
> "If a housewife in Atlanta on the Georgia system turns on a light, every generator on Florida's system almost instantly is caused to produce some quantity of additional electric energy which serves to maintain the balance in the interconnected system between generation and load. If sensitive enough instruments were available and were to be placed throughout Florida's system the increase in generation by every generator on Florida [Power & Light] could be precisely measured."

The hearing examiner concluded:

> "The cause and effect relationship in electric energy occurring throughout every generator and point on the Georgia, Corp and Florida systems constitutes interstate transmission of electric energy by, to, and from Florida. It is the electromagnetic unity of response of Florida, Corp, Georgia and other interconnecting systems that constitutes the interstate transmission of electric energy by Florida." [9]

By this analysis a change in FP&L's load or generating pattern depletes or adds to the force available in out-of-state lines; therefore FP&L is transmitting energy in interstate commerce.

The alternative analysis by the Commission and its staff experts concentrates on power flow within the "Turner bus"—the point of connection between Corp's and FP&L's systems. Power supplied to the bus from a variety of sources is said to merge at a point and to be commingled just as molecules of water from different sources (rains, streams, etc.) would be commingled in a reservoir. On this basis the FPC need only show (1) FP&L power entering the bus and (2) power leaving the bus for out-of-state destinations at the same moment, in order to establish the fact that *some* FP&L power goes out of State.[10] The FPC purported to make this demonstration by a series of tracing studies.[11]

FP&L objects. The first approach is said to be tech-

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[9] Opinion of the Hearing Examiner, 37 F. P. C., at 567–568.

[10] If any FP&L power has reached Georgia, or FP&L makes use of any Georgia power, no matter how small the quantity, FPC jurisdiction will attach because it is settled that Congress has not "conditioned the jurisdiction of the Commission upon any particular volume or proportion of interstate energy involved, and we do not . . . supply such a jurisdictional limitation by construction." *Connecticut Light & Power Co.* v. *FPC*, 324 U. S. 515, 536. See also *Pennsylvania Water & Power Co.* v. *FPC*, 343 U. S. 414 (1952).

[11] See Exhibits Nos. 18 and 19, pp. 1048–1059 (T).

nologically sound, but legally insufficient in that it does not demonstrate that any FP&L power flows *in* interstate commerce, but only that it *affects* interstate commerce. Congress, it is argued, could have chosen to grant the FPC jurisdiction over activities affecting commerce, but it clearly did not do so.[12]

The second approach of the FPC purports to meet the standard at law, but according to FP&L it is technologically unsound. A bus is not a point, but rather a tangible, physical three-strand power line, in this case 225 feet in length. It is argued that it is not a general reservoir. Power, according to this argument, enters and is drawn off the line at discrete identifiable points. Power from any given source will not flow further along the line than loads of wattage cumulatively equal to the wattage of the power source. The distribution of entry lines and wattage loads on the Turner bus is said to demonstrate that all of the FP&L's power will be exhausted by Corp's load lines before the point, further down the line, where Georgia's load intervenes. When power flows in the opposite direction (*i. e.*, north to south) again the effect is one of displacement: Georgia's power goes to Corp's loads and the output of Corp's generators is thus displaced to FP&L.

III

We do not find it necessary to approve or disapprove the Federal Power Commission's analysis based on unity

[12] This argument is developed by the dissent in *Jersey Central Power & Light Co.* v. *FPC*, 319 U. S. 61, 78 *et seq.* Note particularly p. 88: "It is interesting to compare, in this connection, other statutes enacted by the same Congress [as the one which enacted Part II of the Federal Power Act]. Three adopted in July and August 1935 covered activities 'affecting' commerce; three, including the Federal Power Act in question, adopted in August 1935 did not cover activities 'affecting' commerce." Thus it was inferred that we are dealing with a particularly "discriminating use of language."

of electromagnetic response. Its alternative assertion that energy commingles in a bus is, in our opinion, sufficient to sustain jurisdiction.

In evaluating this second approach, the courts are called upon to do no more than assess the Commission's judgment of technical facts. If the Commission's conclusion of commingling is not overturned, then the legal consequences are clear.

The conclusion of the FPC that FP&L energy commingled with that of Corp and was transmitted in commerce rested on the testimony of expert witnesses. The major points expounded by these witnesses were probed, and in our opinion not undercut, by the hearing examiner's questions, FP&L's cross-examination, and rebuttal testimony of FP&L witnesses. The hearing examiner found the testimony persuasive and held that his conclusions could be independently reached upon it. A majority of the Commission, reasoning similarly, endorsed these conclusions.

A court must be reluctant to reverse results supported by such a weight of considered and carefully articulated expert opinion. Particularly when we consider a purely factual question within the area of competence of an administrative agency created by Congress, and when resolution of that question depends on "engineering and scientific" considerations, we recognize the relevant agency's technical expertise and experience, and defer to its analysis unless it is without substantial basis in fact. An appreciation of such different institutional capacities is reflected in the congressional directive defining the terms of judicial review of FPC action: "The finding of the Commission as to the facts, if supported by substantial evidence, shall be conclusive." Federal Power Act § 313 (b), 16 U. S. C. § 825*l* (b). See *Gainesville Utilities Dept.* v. *Florida Power Corp.*, 402 U. S. 515, 526–529 (1971).

The Court of Appeals appears to have rejected the Commission's conclusions for two reasons. First, it apparently regarded these conclusions as supported by mere speculation rather than evidence. In its view, expert opinion about the nature of reality, however logically compelling, is not fact.[13] Second, even if the Commission's views might be said to be supported by substantial evidence, the Court of Appeals apparently thought it important that the Commission acknowledged that its conclusions rest upon representations of a reality imperfectly understood. From this the Court of Appeals concluded that it was dealing with a "simplified characterization" which, despite the frequent use of that same characterization by other courts of appeals,[14] was too uncertain in its application to any particular situation to be used as the basis for establishing jurisdiction.

We reverse and reinstate the FPC's order because we do not think these points are well taken. As to the Court of Appeals' first reservation we hold that well-reasoned expert testimony—based on what is known and uncontradicted by empirical evidence—may in and of itself be "substantial evidence" when first-hand evidence on the question (in this case how electricity moves within

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[13] "Neither the examiner nor the Commission treated the commingling theory as a scientific fact depicting accurately what does occur but only as the more adequate way to conceptualize actual occurrences.

"The Commission expert witness Jacobsen acknowledged commingling has never been verified experimentally as fact." 430 F. 2d 1377, 1384–1385.

[14] See principally *Indiana & Michigan Electric Co.* v. *FPC*, 365 F. 2d 180 (CA7), cert. denied, 385 U. S. 972 (1966); *Arkansas Power & Light Co.* v. *FPC*, 368 F. 2d 376 (CA8 1966); *Public Service Co. of Indiana* v. *FPC*, 375 F. 2d 100 (CA7), cert. denied, 387 U. S. 931 (1967); *Cincinnati Gas & Electric Co.* v. *FPC*, 376 F. 2d 506 (CA6), cert. denied, 389 U. S. 842 (1967).

a bus) is unavailable.[15] This proposition has been so long accepted,[16] and indeed has been so often applied specifically to challenges to the FPC's determination of

[15] "Sometimes the reason for tolerating a gap either between evidence and findings or between findings and decision has to do with limitations of human intellects or limitations on the magnitude of investigations that may be conducted in particular circumstances. Not all propositions of fact that are useful and used in the administrative process are susceptible of proof with evidence. Or developing the evidence would be inordinately expensive." 2 K. Davis, Administrative Law Treatise § 16.11, p. 473 (1958).

[16] The weight of such testimony was properly recognized by Lord Mansfield some 190 years ago:

"The facts in this case are not disputed. In 1758 the bank was erected, and soon afterwards the harbour went to decay. The question is, to what has this decay *been owing? The defendant says*, to this bank. Why? Because it prevents the backwater. That is matter of opinion:—the whole case is a question of opinion, from facts agreed upon. Nobody can swear that it was the cause . . . . [T]he parties go down to trial . . . and Mr. Smeaton is called. A confusion now arises from a misapplication of terms. It is objected that Mr. Smeaton is going to speak, not as to facts, but as to opinion. That opinion, however, is deduced from facts which are not disputed—the situation of banks, the course of tides and of winds, and the shifting of sands. His opinion, deduced from all these facts, is, that, mathematically speaking, the bank may contribute to the mischief; but not sensibly. Mr. Smeaton understands the construction of harbours, the causes of their destruction, and how remedied. In matters of science no other witnesses can be called. . . . The question then depends on the evidence of those who understand such matters; and when such questions come before me, I always send for some of the brethren of the Trinity House. I cannot believe that where the question is, whether a defect arises from a natural or an artificial cause, the opinions of men of science are not to be received. . . . The cause of the decay of the harbour is . . . a matter of science . . . . Of this, such men as Mr. Smeaton alone can judge. Therefore we are of opinion that his judgment, formed on facts, was very proper evidence." *Folkes* v. *Chadd*, 3 Doug. 157, 158–160, 99 Eng. Rep. 589–590 (1782).

Modern analysis follows this perception. See 7 J. Wigmore, Evidence §§ 1917–1929, 1976 (3d ed. 1940 and Supp. 1970).

technical matters, that we do not consider it fairly in dispute. See, *e. g.*, *FPC* v. *Southern California Edison Co.*, 376 U. S. 205, 209 n. 5 (1964); *Travelers' Indemnity Co.* v. *Parkersburg Iron & Steel Co.*, 70 F. 2d 63, 64 (1934); *United States ex rel. Chapman* v. *FPC*, 191 F. 2d 796, 808 (1951), aff'd, 345 U. S. 153 (1953). As Judge Parker said in the Court of Appeals' opinion in the latter case:

> "The [substantial-evidence] rule is no different because the questions involve matters of scientific knowledge and the evidence consists largely of the opinion of experts. The court may not, for that reason, ignore the conclusions of the experts and the Commission and put itself in the absurd position of substituting its judgment for theirs on controverted matters of hydraulic engineering. It is in just such matters that the findings of the Commission, because of its experience and the assistance of its technical staff, should be accorded the greatest weight and the courts should be most hesitant to substitute their judgment for that of the Commission." 191 F. 2d, at 808.

On affirming, this Court noted,

> "[W]e cannot say, within the limited scope of review open to us, that the Commission's findings were not warranted. Judgment upon these conflicting engineering and economic issues is precisely that which the Commission exists to determine, so long as it cannot be said, as it cannot, that the judgment which it exercised had no basis in evidence and so was devoid of reason." 345 U. S., at 171.

The elusive nature of electrons renders experimental evidence which might draw the fine distinctions required by this case practically unobtainable. That does not

—mean that expert testimony is insubstantial and that FP&L is beyond federal regulation.

We think the second, related, concern expressed by the Court of Appeals exaggerates the standard of proof required in civil cases such as this. The lower court would apparently require tracing studies showing an energy flow-through like that demonstrated in *Jersey Central*.

We do not think *Jersey Central* sets such high jurisdictional standards. Special circumstances in that case (the occasional operation of PSE&G as a null factor) permitted the FPC to present clear and compelling proof of interstate transactions. But we assessed the FPC's determination not by the standards of certainty, but rather by the substantial-evidence test.[17] The fact that the FPC was exceptionally convincing in that leading case does not raise the standard that it must meet in all future cases.

Finding no reason in the case law for imposing a standard of certainty, we are not willing to construct one. It is not true, as argued by respondent, that an engineering test of certainty is needed to reserve an area of state jurisdiction. On top of the "engineering and scientific test" that controls this case, the Federal Power Act imposes a "legalistic or governmental" test. Federal jurisdiction may not reach "facilities used in local distribution" of energy. 16 U. S. C. § 824 (b). Thus, state jurisdiction is clearly demarcated and preserved. *Connecticut Light & Power Co.* v. *FPC*, 324 U. S. 515 (1945).

A requirement of tracing studies of the sort demanded by the Court of Appeals—if they are feasible at

[17] "This evidence, we think, furnishes substantial basis for the conclusion of the Commission that facilities of Jersey Central are utilized for the transmission of electric energy across state lines." *Jersey Central, supra*, n. 12, at 67.

all [18]—would take one to two years to conduct.[19] Even under the FPC's supposedly too easily met criteria of jurisdiction, the FP&L matter took almost four years to pass through Commission proceedings;[20] it has been before the courts for four more years. If the congressionally mandated system is to function meaningfully, the judiciary cannot overwhelm it with unworkably high standards of proof. *New England Divisions Case*, 261 U. S. 184, 197 (1923); *Railroad Comm'n of Wisconsin* v. *Chicago, Burlington & Quincy R. Co.*, 257 U. S. 563, 579 (1922).

We note, moreover, that *Jersey Central* type tracing studies become less feasible as interconnections grow more complicated. *Arkansas Power & Light Co.* v. *FPC*, 368 F. 2d 376, 382 (CA8 1966), quoting 34 F. P. C. 747, 751. The requirement of *Jersey Central* type tracing might encourage the artificial and wasteful complication of interconnections for the purpose of avoiding federal jurisdiction. More important, as interconnections proliferate and energy pools grow larger, jurisdictional hurdles like those erected by the Court of Appeals would become ever more difficult to clear. Thus, the greater the need for regulation, the more likely it would become (under the Court of Appeals' rule) that regulation would not be achieved.

As pointed out by the Court of Appeals for the Sev-

[18] "Logic would seem to dictate that where the utility is a member of a combination of utilities and has continuous access to an integrated pool of interstate energy, the tracing of out-of-state energy is indeed difficult, burdensome, and perhaps impossible." *Arkansas Power & Light Co.* v. *FPC*, 368 F. 2d, at 382.

[19] *Public Service Co. of Indiana* v. *FPC*, 375 F. 2d, at 104 n. 7.

[20] The final FPC decision was handed down on May 2, 1967. We do not know when the FPC began its investigation of FP&L. But ignoring what must have been an extended period of initial staff work, we observe that the record shows that FP&L was formally notified on October 3, 1963, that in the opinion of the FPC staff it was subject to FPC jurisdiction. Order Initiating Investigation and Hearing 2412 (T).

enth Circuit in an FPC case similar to this one, even in a criminal prosecution where the highest standards of proof are required, guilt may be shown by circumstantial evidence.[21] The FPC has used tracing studies to show what went into and out of the Turner bus at a given moment; it has marshaled expert opinion to suggest what may reasonably be said to have occurred in the bus at the instant of transmission; it has presented this evidence in a closely reasoned and empirically uncontradicted opinion. Recognizing that the men responsible do not now fully understand electricity,[22] though they know how to use it, and use it on an ever-expanding basis, we do not demand more of the Commission than that its conclusions be substantially supported by expert opinion that is in accord with the facts known for certain. The Commission has done enough to establish its jurisdiction.

The decision of the Court of Appeals is reversed and the case is remanded for reinstatement of the order of the Federal Power Commission.

MR. JUSTICE STEWART, MR. JUSTICE POWELL, and MR. JUSTICE REHNQUIST took no part in the consideration or decision of this case.

MR. JUSTICE DOUGLAS, with whom THE CHIEF JUSTICE concurs, dissenting.

There can be no doubt that Congress has constitutional power to regulate under the Commerce Clause the inter-

[21] "We reject I&M's fundamental proposition in this case that in order to prevail, the Federal Power Commission must do what I&M claims to be impossible, that is, to prove by either tracing or some other unnamed 'scientific and engineering proof' that out-of-state energy reaches the wholsale customers. We might recall that even in criminal cases, guilt beyond a reasonable doubt often can be established by circumstantial evidence." *Indiana & Michigan Electric Co.* v. *FPC*, 365 F. 2d 180, at 184.

[22] "Nobody can say for certain just how electricity is really transmitted." Opinion of the Hearing Examiner, 37 F. P. C., at 568.

state "commingling" of electric power involved in the instant case. See *Connecticut Light & Power Co.* v. *FPC*, 324 U. S. 515, 525–530. The question is whether it has done so.

The Examiner explains the "electromagnetic unity" theory and tells us in electrical engineering terms why that unasserted power of Congress exists:

> "An electric utility system such as [respondent's] is essentially an electro-mechanical system to which all operating generators on the interconnected network are interlocked electromagnetically. This means that electric generators, under ordinary operating conditions, run either at exactly the same speed or at speeds which will result in a frequency of 60 cycles. No operating generator can change its speed by itself as long as it operates connected to the network. All generators connected to the same network must follow each other as to speed and frequency whenever there is a change in frequency, and the frequency of all interlocked generators is always exactly the same.
>
> "The electric systems of [respondent] and all other interconnected systems are essentially alike as to electrical, electromagnetic and electromechanical characteristics. Because they are alike, it is possible to have presently existing interconnected operations on a very large scale, extending from the Rocky Mountains to the Atlantic Ocean and from the Canadian to the Mexican border.
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> . . . . .
>
> "If a housewife in Atlanta on the Georgia system turns on a light, every generator on [respondent's] system almost instantly is caused to produce some quantity of additional electric energy which serves to maintain the balance in the interconnected system between generation and load." 37 F. P. C. 544, 567–568.

Evidently undesirous of explicitly overruling the proposition that "[m]ere connection determines nothing," *Jersey Central Power & Light Co.* v. *FPC*, 319 U. S. 61, 72 (1943), the Court avoids validating the FPC's electromagnetic unity theory as the jurisdictional hold over the respondent. Instead, relying on the Commission's expertise, the Court purports to hold a narrower ground that actual flows of FP&L's electricity were in fact measured passing out of Florida through the employment of the Commission's "commingled" tracing method. Closer analysis of this latter wizardry, which had previously been rejected by the Commission, *Connecticut Light & Power Co.*, 3 F. P. C. 132 (1942), reveals, however, that actual flows were not in fact measured but were simply hypothesized using an engineering model which, as the dissenting commissioners observed, "[assumed] the fact in issue, and thus [begged] . . . the question of jurisdiction." The conventional tracing method previously used in cases such as this one reached an entirely different result—that no actual interstate flow of FPL power had occurred. *Jersey Central Power & Light Co.* v. *FPC, supra; Connecticut Light & Power Co.* v. *FPC*, 324 U. S. 515.

The Commission's abandonment of the conventional test in favor of the commingled method will now mean that every privately owned interconnected facility in the United States (except for those isolated in Texas) is within the FPC's jurisdiction. Both tracing methods assume that a momentary increase in FP&L's generation over its local needs will be passed on to the interconnecting Florida Power Corp. (Corp) system located between FP&L and the state line. The conventional system assumes that such excesses will be absorbed by the first few loads reached in the Corp system and therefore will never cross the state line. On the other hand, the commingled approach assumes that the first load which the FP&L excess

reaches will continue to rely upon other utilities' power to a large extent and therefore will absorb only a part of the FP&L excess. The leftover FP&L excess will then travel to the next load, but again, will only supply part of those consumers' needs, with the remainder passing on to the next load, and so on, until some fractional part of the original FP&L excess crosses the state line. Extending the assumption's application, it is clear that any momentary increase in output by any generator located at any point in the ISG grid will send a surge of power throughout the entire network. If this assumption is approved, then it is difficult to perceive what remains of the *Jersey Central* proposition that "[m]ere connection determines nothing."

These scientific facts are, of course, the basis for the grid systems, much in vogue these days. But the Commission has no authority to order a company to enter a grid. Unless it is done voluntarily, as was true here, the Commission by virtue of § 202 (b) of the Federal Power Act can act only[1] "upon application of any State commission or of any person engaged in the transmission or sale of electric energy." 16 U. S. C. § 824a (b).

A company transmitting electric energy in interstate commeree is subject to regulation by the Commission of its wholesale rates. 16 U. S. C. § 824 (b). But there is no claim here that wholesale selling is involved; and the minuscule nature of the "commingling" that has taken place and its incidental nature are doubtless the reasons why the Commission has not undertaken that phase of regulation. The case is therefore unlike *Pennsylvania Water & Power Co.* v. *FPC*, 343 U. S. 414, 419–420. All that is involved here is an effort to make respondent

[1] Apart from the exigencies of "war." See 16 U. S. C. § 824a (c).

follow the Commission's Uniform System of Accounts.[2] 16 U. S. C. § 825 (a).

Rather than the engineering battle over tracing methods, the central question ought to be whether the "commingling" is so *de minimis* as to warrant the fastening of the federal bureaucracy on this local company. The limited purpose of this legislation was stated clearly in the Senate Report:

> "The decision of the Supreme Court in *Public Utilities Commission* v. *Attleboro Steam & E. Co.* (273 U. S. 83) placed the interstate wholesale transactions of the electric utilities entirely beyond the reach of the States. Other features of this inter-

[2] This is not a case where state regulation has a hiatus that the federal regime fills. There is not, in other words, a no-man's area here.

Fla. Stat. § 366.05 (1969), authorizes the Florida Power Commission to "prescribe uniform system and classification of accounts for all public utilities; which among other things shall set up adequate, fair and reasonable depreciation rates and charges." A related section includes within the term public utility every person, corporation, partnership, association, or other legal entity and their lessees, trustees, or receivers operating, managing, or controlling any plant or other facility supplying electricity. *Id.*, § 366.02.

The Commission exercises this power. See 1966 Florida Public Service Comm'n Annual Report 11:

"The Acounting and Auditing Department has the responsibility of maintaining surveillance over the books and records of the various companies within the *Electric* . . . industries subject to regulation by the Commission.

"In meeting this responsibility, the Department maintains a comprehensive file of statistical, financial, and accounting data in the form of annual, quarterly, and monthly reports submitted by the various companies. It maintains a continuous examination of these reports and conducts continuing field audits on the company premises to verify the accuracy . . . to determine the compliance of the basic accounting records with the *Uniform System of Accounts prescribed in the Commission's Rules and Regulations.*" (Emphasis supplied.)

state utility business are equally immune from State control either legally or practically." S. Rep. No. 621, 74th Cong., 1st Sess., 17.[3]

While federal regulation was to be pervasive, once fastened onto a company, Congress expressed an unambiguous policy to preserve and to rely upon effective and adequate state regulation:

> "*The revised bill would impose Federal regulation only over those matters which cannot effectively be controlled by the States.* The limitation on the Federal Power Commission's jurisdiction in this regard has been inserted in each section in an effort to prevent the expansion of Federal authority over State matters." *Id.*, at 18 (emphasis supplied).

And this objective is presented in the statute's language:

> "It is hereby declared . . . that Federal regulation . . . is necessary in the public interest, such Federal regulation, however, to extend only to those matters which are not subject to regulation by the States." Public Utility Holding Company Act of 1935, § 201 (a), 49 Stat. 847.

The Commission does not assert that Florida's regulation of FP&L is inadequate. Each year the Florida Public Service Commission conducts field audits of electric utilities to ensure compliance with its accounting practices and depreciation rates.[4] Other than enhancing the slogan

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[3] *Public Utilities Comm'n* v. *Attleboro Steam & Electric Co.*, 273 U. S. 83 (1927), held that even absent federal legislation the Commerce Clause precluded state rate regulation of sales of energy made by a Rhode Island producer of electricity to a Massachusetts distributor. Thus, one purpose of the Act was to fill the "Attleboro gap" in rate regulation.

[4] Inasmuch as virtually every privately owned utility in the United States (save those in Texas) is interwoven with a grid which at some point intersects a state boundary, the Commission's commingled tracing assumption will effectively eliminate electric utility

of "federal leadership" the Commission cites no function which it might better fulfill than the state regime.

The Court's result also runs counter to the expressed desire of Congress to encourage voluntary interconnection. *Id.*, § 202 (a), 49 Stat. 848. Interconnection between two local companies will now subject both to federal jurisdiction if either is also connected to a grid which at some point crosses a state line. To avoid the costs associated with switching from state to federal regulation a utility may now be induced to sever such interconnections. As the dissenting commissioners recognized:

> "[I]nterconnections serve the objective of reliability, and . . . reliability is strongly in the public interest. But with the present near universality of interconnections, it would seem that the Commission's opinion would as likely lead to present connections being broken as to new connections being established or existing connections strengthened." 37 F. P. C., at 559 (1967).

In light of these congressional purposes I would not superimpose federal regulation on top of state regulation in case of *de minimis* transmissions not made by prearrangement or in case of wholesale transactions. In *Jersey Central Power & Light Co.* v. *FPC, supra,* at 66–67, we let federal regulation be fastened, though the energy transmitted was "small." Yet the transmissions apparently were neither accidental nor *de minimis. Id.,* at 66 n. 4.

In the instant case respondent is a member of the Interconnected Systems Group (ISG) which covers the southeastern and central portions of the United States.

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regulation by States. In light of the congressional intent to avoid this outcome the Court has placed perhaps excessive reliance on the doctrine of judicial deference to agency expertise.

The Commission approved the Examiner's finding that "all 140 members of the ISG operate in parallel and are interlocked electromagnetically; and that FPL [respondent] can receive from or contribute to ISG up to 100 mw. The record further supports the Examiner's findings that FPL normally has no control over the actual transfers of electric power and energy with any particular electric system with which it is interconnected; that since electric energy can be delivered virtually instantaneously when needed on a system at a speed of 186,000 miles per second, such energy can be and is transmitted to FPL when needed from out-of-state generators, and in turn can be and is transmitted from FPL to help meet out-of-state demands; and finally, that there is a cause and effect relationship in electric energy occurring throughout every generator and point on the FPL, Corp, Georgia, and Southern systems which constitutes interstate transmission of electric energy by, to, and from FPL." 37 F. P. C., at 549.

In the instant case apart from the infinitesimal and sporadic exchanges the Commission only found that "FPL [respondent] contributed 8 mw to ISG to assist a midwestern utility which had sustained a 580-mw generator loss." *Ibid.* And that single episode could be measured in terms of seconds only. Such fleeting episodes are not in my view sufficient to displace a state regime with the federal one, since the Congress promised that as much as possible be left to the States. I would not make that a hollow promise.

If we allow federal pre-emption in this case, then we have come full cycle leaving local authorities control of electric energy only insofar as municipal plants are concerned. The federal camel has a tendency to occupy permanently any state tent.

That may be a wise course; but if so, Congress should make the decision.